KNOWLEDGE
AN
ILLUSTRATED MAGAZINE
OF
SCIENCE, LITERATURE, & ART

*LONDON: APRIL* 1, 1887.

## THE COMPLEXITY OF THINGS.

By Grant Allen.

ONE of the feelings which most grows upon the scientific observer, as his knowledge of the world in which his life is cast gradually increases, is a profound and abiding sense of the infinite interaction of cause and effect, the immense and immeasurable complexity of things in this universe. Glib ignorance is always ready with an easy explanation or a hasty prophecy; mature experience distrusts more and more from day to day its own power of prognostication, or even of analysis. Look, for example, at the readiness with which the local weather prophet will confidently assert that we are going to have a hard winter or a late spring. Upon what endless interrelations of causes and events, all the world over, does the weather of an English season depend! What knowledge of the ice packs in the Arctic regions, of the bergs that float and melt in the Atlantic currents, of the depth of snow on the Siberian plains, of the strength and direction of the Gulf Stream and its divergent branches, of the prevalent conditions in Sahara, Spain, and the Mediterranean, is necessary in order adequately to forecast the British weather for the next twenty-four hours! An east wind, blowing over the frozen plains of Central Europe, brings us frost and ice and sunshine to-day; a westerly breeze, fresh from the warmer currents of the Gulf, brings us cloud and rain and thaw to-morrow. Our fruit-trees have their blossoms nipped in the flowering season, because great blocks of glacier have disengaged themselves prematurely from the melting cliffs of the Greenland ice-sheet; our strawberries ripen in good time because a change in the distribution of atmospheric pressure causes a downward current of heated air to set in towards Britain from the African desert. Why is the west wind so unwontedly bitter to-day? Because there are ice-floes off the coast of Labrador. Why does the fog hang heavy over London this morning? Because a certain motionless state of air prevails over Western Europe, from Hammerfest to Lisbon. Why did our pears fail to set their fruit? Because of the early spring in North-Eastern America. Why did our roses get nipped by the frost? Because of the clear weather over the Hindu Koosh and the valley of the Lena. Mr. Robert Scott, enthroned in the Meteorological Office in London, with constant telegrams informing him from moment to moment of every fluctuation in barometric readings at Valentia or Bayonne, every rise of temperature in the Bay of Biscay or the North of Scotland, every shower of rain off the Norwegian Islands, every passing thunderstorm in Auvergne or Dalecarlia, can scarcely prognosticate the coming weather for twenty-four hours in advance with any approach to probability. Yet the local weather prophet, unabashed by his utter ignorance of the conditions of the entire problem, will predict the weather of a whole season as confidently as though he held all the threads in his own hands, and directed the winds and waves irresponsibly from an easy-chair in his own drawing-room.

What would be the effect upon the climate of Western Europe if we were to turn Sahara into an inland sea? What would be the result upon the world's weather if we were to cut a large outlet for the heated waters of the Caribbean Sea through the Isthmus of Panama? Most people are prepared at a moment's notice to dogmatise freely as to what would happen in either of these extreme and improbable cases. They will say offhand that the flooding of Sahara would improve the climate of North Africa generally, and that the diversion of the Gulf Stream would reduce Scandinavia and Britain to the respective conditions of Greenland and Manitoba. But how infinitely complex is each such problem! Who shall say what changes might be induced, when Sahara was flooded, by the alteration in the hot, dry winds which now blow off the wide expanse of desert? What melting effects do they ultimately produce upon the ice and snow of the Spanish Sierras, the Pyrenees, the Alps, and the Carpathians? What extra growth of glaciers would descend, in their absence, upon the plains and valleys of Castile, of Languedoc, of Switzerland, and of Lombardy? What varieties would these, again, induce in the Föhn, in the Bora, in the Mistral, in the Tramontana? Every variation in the amount of moisture due to evaporation will give rise to changes in rainfall, in snow, in ice, in glaciers; will produce new phenomena of denudation, of river forming, of earth sculpture, of local climate; and will therefore react at last upon vegetation, upon fauna, upon agriculture, and upon human life and industry in general. More seas in Africa might mean more rain and snow and ice on Atlas; more cooling of the air in Southern Europe as a whole; more accumulation of glaciers over all the mountain ranges of our peninsular area; in short, a complete upsetting of the climatic balance in this quarter of the world as we actually know it. But I do not say it would necessarily do so. I do not wish to dogmatise. On the contrary, I believe the complexity of these problems surpasses existing human powers of combination. It is impossible to keep all the factors of so vast a sum always before one's mind in the act of computation. When one reads speculations like Dr. Croll's or Mr. Alfred Russel Wallace's the mind is carried away for the moment by their sustained reasoning; it seems all as clear as day; the glacial epoch was doubtless due to the earth's eccentricity, and if we could once melt off the Polar ice-cap, subtropical vegetation might once more spread to the frozen shores of Spitzbergen and Alaska. But when we come, on the other hand, to read such a book as Professor Mohn's "Météorologie" we feel as though the problems of our existing climate even were far too complex for human solution.

Let me give a single instance in illustration of the difficulty of predicting the effect upon climate or earth-sculpture of local changes. In a small town in the West of England the cliffs were being rapidly washed away by the sea. Groynes were erected along the beach, but where they terminated the current formed a scour, and, eating away the cliff worse than ever at the end, began to attack the town by a flank movement. So an eminent engineer was called in to advise the Corporation as to the erection of a breakwater. The eminent engineer, after duly inspecting the bay and cliffs, reported that to erect a breakwater on ledges of rock in the neighbourhood would be comparatively easy, but when erected it might produce either of two effects with equal probability. It might protect the menaced cliffs, or it

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might set up special eddies which would wash away the town faster than ever. The Corporation, thus advised, dropped the breakwater, and preferred to leave themselves in the hands of Nature. Indeed, on an open line of coast, exposed to varying winds and diverse currents, it is almost impossible to say beforehand what will be the effect under all circumstances of any given change of contour in projecting portions.

Look for a moment at another case familiar to everybody who owns a garden. How infinite are the diversities of soil and climate and situation within a single little patch of a quarter of an acre! Here, the snow lies long; there, the radiation from a wall melts it rapidly; yonder, again, the drifting due to eddies caused by the neighbouring palings ridges it up into a low mound, which resists for many days together the melting effects of the sun and of the warm westerly breezes. Round this corner here the wind whistles so fiercely that not even spruce firs will thrive and flourish; on the opposite side the house gives shelter from the cold east winds, and sub-tropical annuals—like the castor-oil plant—will grow vigorously from seed in a sunny exposure. At one point the dripping from the roof waterlogs the grass; at another, too rapid drainage through the sandstone soil allows it to dry up and wither, unless constantly moistened by the garden hose. The shade of the Portugal laurels interferes with the free development of the scarlet anemones; the hyacinths, at this end of the bed, are later by a week than their sisters at that end, because the shadow of a tall poplar wheels over them for three hours daily, intercepting their due share of the morning sun. One's own little garden, in fact, is a petty epitome of all the facts of climate in the world, too complex for the most diligent observer and reasoner ever fully to comprehend its minute diversities. The mound of snow where the children made the snow-man, which lasted unmelted after a fortnight's thaw, represents in miniature the Alps and the Himalayas, or the obstinate Polar ice-cap itself. There are windy corners and sheltered nooks, inexplicable patches where the grass will never grow on the lawn, spots where the wall-flowers blossom in February, and spots where they linger till late in June. When I look at the endless complexity of the square mile that lies around my own house, at the diversity of flora on the two sides of the road that runs through Milton Heath, at the differences caused by the northern and southern aspect of the round barrow on the hilltop, at the climatic varieties of chalk and greensand and weald clay, with their accompanying peculiarities of fauna and flora, I am appalled at the temerity of men who will dogmatise freely about the causes of mild arctic climates, or the effects of drying up the Atlantic Ocean. Why, a complete account of the causes which lead to the climate of a single house from day to day would baffle the wisest meteorologist in Europe. The thermometer just now in this very room stood at 56° beside the bookcase when it was 61° on the centre table. A removal to a position two feet higher on the sideboard sent it up a couple of degrees. Put your finger to the key-hole when the door is shut, and feel the cool air rushing in, in a jet, like water through the cracks in a floodgate, and you can faintly realise the turmoil and commotion of the atmosphere of the place in which you are now sitting. If you could see it coloured, so as to make the movements visible, you would find it a theatre of endless eddies and currents, of actions and reactions marvellous and innumerable—heated air flowing up the chimney; cold air to replace it rushing in at the cracks of the doors and windows; carbonic acid from your breath falling to the floor; aqueous vapour floating idly about in little dispersed clouds and flocculi; heated gases ascending to the ceiling; everywhere whirls and curls and rigmaroles, dancing and eddying in a perpetual vortex. Our human habit is to reduce every problem too much to naked simplicity. The concrete world in which we live consists, on the contrary, of infinitely complex interactions of cause and effect, which it is well-nigh impossible for us adequately to disentangle one from the other.

## PRIZE COMPETITIONS.

By Richard A. Proctor.

I KNOW no more amusing development of modern journalism than the system of Prize Competitions, by which the time-wasting idiots who formerly struggled for fame by solving the imbecilities called acrostics are now invited to decide who are the greatest statesmen, poets, philosophers, painters, of such and such nations or times, and which the greatest of their works. (I have called the acrostic-solvers wasters of time; but on second thoughts I withdraw the remark: *their* time could hardly be wasted.) Of course we know beforehand that, in struggling for the prizes in the more recent competitions, these folk carefully avoid any attempt to judge for themselves. What they try to do is to guess who are likely to be generally selected as greatest in the several departments dealt with, and by choosing those to secure the best chance of the prizes doled out to them by the proprietors of papers employing this clever dodge for checking loss of circulation. Still, although for this reason the system is not really so outrageously absurd as it seems to be on the face of it, yet even the appearance of weighing the opinions of those who necessarily have no judgment is an absurdity which cannot but degrade journalism.

Imagine, for example, a score of the foolish folk who had been successful in solving acrostics according to their "lights" (the acrostics' lights, I mean) attempting to decide, from their own knowledge, on the twelve greatest poems in the English language! Even the average opinion of the community would decide wrong on such a subject as this; and these strange beings must be altogether below the average, or they would never be found among the acrostic-solvers. We know that to untrained minds, which is the same as saying to the majority, a Tupper or a Robert Montgomery seems a greater poet than a Shakespeare or a Milton—until some one shows them the absurdity of what they have mistaken for sublimity. We only have to note what such minds turn to naturally, and would continue to admire, were they not corrected, to see that this is the case—though, indeed, it is simply what might be expected. Consider the sale which Tupper's "Proverbial Philosophy" obtained during about a quarter of a century, despite its utterly prosaic and commonplace character! Or recall the way in which the bulk of the community accepted the ruined plagiarisms and ungrammatical idiocies of Robert Montgomery as poetry, equalling, if not surpassing, Milton's best! Even Macaulay's crushing criticism in the *Edinburgh Review* did not kill Robert Montgomery at once. ("Breaking a butterfly on the wheel," some called Macaulay's criticism; but crushing a cockroach would be nearer the mark.) I remember well how his pretentious absurdities were selected for reading by enthusiastic admirers as late as a score of years after Macaulay's review should have taught even the silliest of Montgomery's admirers what tawdry tinsellings they had mistaken for real poetry.

Imagine folk compared with whom the admirers of Tupper and Montgomery were excellent judges invited to pronounce on the merits of Chaucer and Spenser, Shakespeare and Milton, Dryden and Pope, Wordsworth, Coleridge, Scott, Byron,

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Browning, and Tennyson! Conceive such self-convicted imbeciles as the acrostic-solvers pretending to decide between Scott and Thackeray, George Eliot and Georges Sand, Charles Reade, Bulwer Lytton, and Dickens. If they spoke their real minds we know they would pronounce for Ouida, or for the novelists of the *Family Herald* and the *London Journal*. Ask some draper's assistant or grocer's lad, whose real taste is for tales of highwaymen, what he thinks of Christie Murray's "Aunt Rachel" as compared with "Redhand the Rover"; ask 'Arry or 'Arriet whether a study of street life by Murillo or a brilliant chromo of "Lancer and Vivandière" is most to be admired. You would certainly get a reply saying little in favour of Murray's charming idyll or Murillo's masterpiece of *genre*. But such a decision would be wisdom itself compared with the real opinion of acrostic-solvers, if only they would give it on questions of philosophy or statesmanship, poetry or fiction, art or music, science or religion.

It is worthy of remark, not to notice further the self-proclaimed imbecility of acrostic-solvers *et id genus omne*, that the opinions of majorities on all questions of difficulty are almost certain to be wrong, if really independent—nay, absolutely certain to be wrong. Such opinions never are independent, so that it can do no harm to indicate the certainty of the wrong decision of most men when really judging for themselves. The world at large accepts its great men (generally after death) on trust, and adopts their ideas on the assumption that they are probably right. If we had to wait till the majority independently adopted correct ideas we should have to wait long enough. In science we should still regard the earth as flat and the moon as ruling the weather; the elements as four only; the sun, moon, and stars as meant chiefly for signs, and comets for portents. In politics and religion I know not what follies men would believe in, other than those at present in vogue; for men do not accept political and religious ideas on trust from the wiser, but form their own opinions, and so illustrate my thesis more effectively than satisfactorily. In poetry and fiction, in music and in painting, the prevalent ideas would be semi-savage indeed did not the majority take their opinions chiefly from those who know.

Putting the matter as one of probabilities, we see that it cannot be otherwise. Let a hundred average members of even the most cultured community give their independent opinions on some question of difficulty—not of such extreme difficulty as, for example, the nature of Deity, or a future life, but of moderate difficulty, as the principle of hereditary legislation, the value of colonies and conquered countries, or the like. The chance that any one of the hundred gives a just opinion, independently, on such a question is much exaggerated when it is set as one in ten (one in a million would be an exaggerated estimate for the extremely difficult questions first mentioned). Assuming, however, even so unlikely a chance of a right opinion as this, what chance would there be that a majority of the hundred would decide rightly? The same chance that there would be of drawing more than fifty white balls at random from a hundred vases, each containing ten balls, one only of which is white—one drawing only being made from each vase. Calculating this chance, we find the odds against the majority deciding rightly (unless trusting in the judgment of their best teachers) to be millions of millions of millions to one.

The value of the much-vaunted argument from common consent can thus be imagined. Unless a question is one so simple that every one is almost sure to judge rightly, common consent, if it means anything at all, means the practical certainty of common error. Fortunately, it means generally nothing more than the common agreement of most men to accept the opinion which they suppose to be approved by the wiser sort. Yet, even as thus modified, or practically nullified, the opinion of the majority will be wrong ninety and nine times before, on the hundredth trial, it gets right by force of sheer compulsion—and hitherto in the world's history *common consent* has *never* reached the truth in any matter of difficulty.

## THE JUNIORITY OF BEASTS:

### FURTHER REMARKS ON THIS AND KINDRED OF THE CONTENTIONS OF MR. GLADSTONE.

By Oswald Dawson.

I MUST thank Mr. Edward Clodd for his kindly mention of my previous note on this subject. *After* forwarding it * to Knowledge I read the footnote to which he refers, running thus: "The discovery of the lowest mammalian forms in earlier strata than those containing birds seems opposed to the accepted order of succession, but there is considerable uncertainty as to the exact period of the first appearance of birds." Hereupon Mr. Clodd founds an agreement with me. Having to thank Mr. Clodd for a series of really entertaining articles on "The Story of Creation," it would indeed be ungracious to find fault if a well-intentioned footnote of three lines happen to be ill-expressed. Excuse for renewing the subject is to be sought in the circumstance that Mr. Gladstone has contributed to the current issue of the *Nineteenth Century* (August) a brief reply † to Professor Huxley's valedictory surrejoinder.

The succession of organic groups was the chief topic of discussion between these gentlemen, and as the issue of this "tournament, which, whether one regards the dignity of the combatants or the gravity and delicacy of the cause, it is not possible to await without the keenest interest," has not anywhere been concisely stated, an article, in some measure a *résumé*, may be acceptable.

*The Juniority of Animals as against Plants.*—According to Genesis, plants were formed a day before the dawn of animal life; if, as according to Mr. Gladstone, the creation of what are translated whales did really herald that dawn. If cetaceans were in question there would be no discrepancy, as whales probably do not ante-date tertiary times; ‡ but when we read "fishes" in lieu of "whales," as Mr. Gladstone bids us, the evidence from fossils compels us to regard it as very far from a "demonstrated conclusion and established fact" that these animals were created subsequently to the evolution of the higher flora, inasmuch as indubitable remains of fishes of a high order § are found in upper silurian rocks—

* Before March 26. On that date I sent a note requesting the deletion of the words "authority, or at any rate author," as applied to the late Professor Oscar Schmidt. The editor was perhaps on the Continent at this date.

† In the shape of a letter affirming Professor James D. Dana's agreement with Mr. Gladstone on essential points. In the treatise under discussion (*Manual of Geology*, p. 847) Professor Dana emphasises by italics the two following axioms: "This document, if true, is of divine origin." "If divine, the account must bear marks of human imperfection, since it was communicated through man." The former view is answered in the *Westminster Review* (January 1886). The latter—applicable, perhaps, when adapted by spiritualists to account for any hybrid character conspicuous in trance-orations—is not self-evident in the case of divine writings.

‡ The occurrence of *Palæocetus Sedgwickii* in strata of Jurassic age (*v.* Seeley, *Geol. Mag.*, Feb. '65) is accountable otherwise than by assuming that the creature lived at that date (*v.* Owen, *Brit. Foss. Mam. and Birds*, pp. xv. and 520, and *Pal.* p. 321).

§ The *Ganoidei*. In *Onchus* and the "Conodonts" it may be we have representatives of two other orders.

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a fact involving a high antiquity for the class. So that even were the high claims of certain palæozoic plants established, their seniority as against fishes would not be demonstrated, nor yet rendered probable.

*The Juniority of Fishes as against Birds.*—This is, of course, a scientific fact. Genesis, however, does not expressly teach it. Both classes were created on the fifth day. "One is necessarily mentioned before the other." (*West. Rev.* as above.)

*The Juniority of Reptiles as against Beasts.*—This juniority is probable. Professor Huxley never asserted it, as Mr. Gladstone supposes. Nor does Genesis assert so. It seems rather to teach their contemporary origin on the sixth day. Had Mr. Gladstone contended for this, however, or for their origin before beasts during an earlier part of the sixth day, the prior existence of birds on the fifth day would have had to be explained away. The reptiles, however, are submitted to this process instead; in a manner, too, which it has been said would have excited the envy of Artemus Ward. "Reptiles were a family fallen from greatness; instead of stamping on a great period of life its leading character, they merely skulked upon the earth." Mr. Gladstone "would also hold by his previous remark" as to mistranslation and "the general structure and effect of the Mosaic statement," advancing illustrations; these being—(1) that the LXX. represent reptiles "as a sort of appendage to mammals" in a more conspicuous manner than do our versions; (2) "in the Song of the Three Children, where the four principal orders are recited after the series in Genesis, reptiles are dropped altogether, which suggests either that the present text is unsound, or, perhaps more probably, that they were deemed a secondary and insignificant part of it.

Professor Huxley replies thus: "I have every respect for the singer of the Song of the Three Children (whoever he may have been) . . . nor do I venture to doubt that the inconvenient intrusion of these contemptible reptiles . . . into an apologetic argument, which otherwise would run quite smoothly [!], is in every way to be deprecated. Still the wretched creatures stand there, importunately demanding notice." Unless Mr. Gladstone insists that the text being unsound, the terms "creeping thing" and "everything that creepeth upon the earth" mean other than reptiles, or ought to be dropped altogether, the justice of Professor Huxley's demand must be admitted. As to the other argument, the skulking in a day or two late of a class which *did* stamp upon the mesozoic age its leading character—and one member of which played an important *rôle* in the event which immediately succeeds the creation, to say nothing of later occasions, or of the notices taken of other members of the class—was certainly no fault of its own, and it is difficult to imagine what of poetry, or of intelligibility, or of brevity, or of aught else, would have been sacrificed had fowl been formed on the sixth day, and creeping things on the fifth, instead of *vice versâ*. According to some authorities, however, the reptilian class *was* represented before the sixth day.*

* "TeNINeM: Dr. Lightfoot reads this as 'Amphibia,' and makes it include 'crocodiles, hippopotamets,' &c. . . . Parkhurst says the words seem to include both 'the crocodile and whale species.' Bishop Patrick holds the same view. The word translated 'great whales' in verse 21 is the plural of the same word which becomes 'a serpent' in Exodus vii. 9."—*Genesis, its Authorship and Authenticity*, by Charles Bradlaugh, third edition, 1882, p. 69, "International Library of Science and Freethought." "*Tanninim*, that is, crocodiles."—Principal Sir J. W. Dawson, *Expositor*, April 1886. "*Remes*, 'creeping things' . . . may here be taken to represent the smaller quadrupeds of the land."—Dawson, *Idem*, or "prowling" things.—Dana, *Op. cit.* Dr. Fr. H. Reusch, whom Mr. Gladstone modestly recommended to M. Albert Réville as a fitter representative of the reconciliation schools than himself, is antagonistic to Mr. Gladstone's reconciliation theories, at any rate, so far as the topics here under discussion are concerned. See *Nature and the Bible*, opportunely translated by Kathleen Lyttelton, vol. i., pp. 100, 336.

*The Juniority of Beasts as against Birds.*—Mr. Gladstone made a remark indicating his suspicion lest some one should score a point against him by "taking only birds of a very high formation," and not reckoning with *Archæopteryx*, *Hesperornis*, &c., as Mr. Gladstone himself did—a method in striking contrast to that employed by him when dealing with beasts; for birds in the "fourfold order" include fossil types, but as to mammals, said Mr. Gladstone, "I wish to be understood as speaking here of the higher or ordinary mammals, which alone I assume to have been known to the Mosaic writer," though why Moses should have known of *Archæopteryx*, but not of *Microlestes*, Mr. Gladstone does not explain. If this be consistent procedure, the objections I raised when misled by a *lapsus scribendi* of Mr. Clodd's were answered in anticipation. I then mentioned that Professor Huxley's only challenge to this portion of the fourfold order, if challenge it was meant to be, was the remark that "the question of the exact meaning of 'higher' and 'ordinary' in the case of mammals opens up the prospect of a hopeful logomachy." Having taken the matter in hand, however, "I must presume to animadvert with considerable freedom upon" Mr. Gladstone's (to borrow his phraseology) "mode of dealing with authorities."

We have the declaration that Professor H. G. Seeley supplies us "very clearly" with the place of birds in the succession of animal life—*i.e.*, as antedating mammals. The Manual is mentioned and the pages specified. Turning thereto, or to any of the other pages, no such view is enunciated, "clearly" or otherwise. Indeed, what we do read is that "geological history does not carry us back appreciably towards the origins of the great groups of organic nature." "There is evolution, but it is only the evolution of genera and of ordinal groups, and not of classes." Mr. Gladstone has also perused the statements and diagrams of the Phillips-Etheridge portion of the Manual, but these are confessedly of no avail for the present purpose.

Next comes Professor Prestwich's treatise, to the proofs of which Mr. Gladstone had access. Volume I. is now published, and it is to this that Mr. Gladstone referred, mentioning in particular two pages, and discovering here an order of succession which places birds as before beasts. This I fail to find on the pages specified or elsewhere. In the table of contents, however, birds do happen to be enumerated before mammals.

Then follows a postscript reference to the *Odontonithes* by Professor O. C. Marsh, to indicate the probability that the first "bird" was palæozoic. It is perfectly true that Professor Marsh has expressed this opinion, in *Odontonithes* and elsewhere. "For the primal forms of the bird-type we must evidently look to the palæozoic; and in the rich land fauna of our American *permian* we may yet hope to find the remains of both birds *and mammals*" (italics mine). This hope as to the turning up of permian mammals has perhaps escaped Mr. Gladstone's notice; or he might have hesitated to seek an ally in Professor Marsh, as being one liable to "prove too much."

Professor Marsh has, further, expressed the opinion that volant birds may have originated in triassic times—apparently solely on the ground that a (more or less) volant bird (*Archæopteryx*) occurs in the formation above, for he discredits altogether the avian character of the footprints—a method of reasoning which clearly compels us to promptly seek for the ancestors of the triassic mammalia in, at the latest, permian strata. This opinion, therefore, is detrimental to Mr. Gladstone's cause, and is

so whether we "describe animals by *habitat*" or by structure."* In fact this description by *habitat* profiteth nothing. Carl Vogt compares the flight of *Archæopteryx* in some measure with that of *Galeopithecus*. The precise character of its sternum is not yet decided. It is very questionable, however, whether Moses, if inspired to inform us that bird-life commenced a day before beast-life, would have described it (we may ignore Professor Marsh's highly-problematically-avian permian parent of a hypothetically-volant absolutely-unknown triassic progenitor of the dubiously-carinate *Archæopteryx*), as "fowl that may fly above the earth in the open firmament of heaven;" or whether Mr. Gladstone would speak of such creatures as members of the "air-population." Moses had *better* have written of the feathered tribes!

Finally, let us bear this in mind. Had Mr. Gladstone judiciously abstained from referring to the Manual, the treatise, and the monograph, and ignored *Archæopteryx* and its undiscovered avian ancestors as he ignores *Microlestes*, though the logic of his advocacy might have been enhanced in merit, his case would none the less have failed, it being far from a "demonstrated conclusion and established fact of natural science" that "fowl that fly above the earth in the open firmament of heaven" were in existence a day, or an hour, before the advent of the *Eutheria*—whom we will venture to identify with "the higher or ordinary mammals."

*The Juniority of Man as against Mammals.*—Mr. Gladstone wants to know how the juniority of man comes to be set down in Genesis i. Prof. Huxley is supposed to have affirmed as probable that man came last of all animal species. The singularity of Mr. Gladstone's inquiry consists in the fact that he has taken scrupulous care to explain and insist that the Mosaic mention of a class on a particular day referred only to *some* members of that class. Seeing, as he thought, an opportunity to interpret Genesis literally for once, the delusion that every species of beast had been fully evolved before man's creation is eagerly seized upon. Of course beast-life commenced before the human period, but this degree of concordance is now too meagre. In fact, Mr. Gladstone has one rule for birds as a class, and one rule for beasts as a class; also, as we previously saw, one rule for *Archæopteryx*, another for *Microlestes*.

All I have to add to this section of the controversy is the remark that, unless we accept some such theory as that of Mr. S. E. B. Bouverie-Pusey (in *Permanence and Evolution*), avowedly arrived at by guessing, that evolution operated until a recent geological period, and has since ceased, it is *improbable* that man came last of all species. For, as Alfred Russel Wallace pointed out, his bodily evolution waned when intellect became dominant; whereas nothing analogous has interrupted specific differentiation amongst wild animals.

* Unless the *Ratitæ* long antedated the *Carinatæ*. The former may have produced some of the footprints. (*V.* Dr. Henry Woodward, *Proceedings Geologists' Association*, February 1886, pp. 368-69.)

## MYTHS OF NIGHT AND WINTER.

By "Stella Occidens."

(*Continued from p.* 113.)

WE have considered a few of the most popular myths with regard to night and winter in European countries. Let us now cross over to the Western Continent and observe the myths on this subject which prevail among the North American Indians.

Glooskap, according to the Passamaquoddy Indians, once sailed in his stone canoe far away, no one knew where, but beyond the sea. He will return some day. Some say he went to the west. He lives in a very great, a very long wigwam, and he always makes arrows. One side of the lodge is full of arrows now. When it is all quite full, he will come forth at a new twilight of the gods, exterminate the *Iglesmani*, and establish an eternal happy hunting-ground. Glooskap is deliberately preparing for such a fight, thus resembling the solar warriors in the Norse traditions. Glooskap is now living in a Norse-like Asa-heim; but there is to come a day when all the arrows will be ready, and he will come forth and slay all the wicked. Here, again, Norse mythology is identical with the Indian. A day will come when there will be a great final war and death of heroes, and after all a new world:—

> Then shall another come, yet mightier,
> Although I dare not his name declare.
> Few may see further forth
> Than when Odin meets the wolf.*
> ("Hyndluloid," p. 62.)

This idea of Glooskap returning recalls the expected return of Barbarossa, King Arthur, the Three Tells, and other great heroes who are to return some day. On the occasion of a visit of Henry II. to Wales, the Welsh bards recited a poem relating to King Arthur. It told how the latter set forth his trusty knights—

> On conscious Camlan's crimsoned banks,
> By Modred's faithless guile betrayed,
> Beneath a Saxon spear to bleed!

King Arthur is wounded, and all unseen an elfin queen throws her mantle of ambrosial blue over the hero:—

> And bade her spirits bear him far,
> In Merlin's agate-axled car,
> To her green isles enamelled steep,
> Far in the navel of the deep.

She waved an opiate wand o'er his brow, and to the sound of soft music closed her magic curtains round:—

> There renewed the vital spring,
> Again he reigns a mighty king.

Some day he will return to Britain to resume his ancient sceptre:—

> Once more in old heroic pride
> His barbed courser to bestride;
> His knightly table to restore,
> And brave the tournaments of yore.

As another instance of the expected return of a hero, we have the Swiss legend of William Tell. This skilful archer, who shot the apple off his son's head, is no other than the last reflection of the sun, according to Dr. Dasent. "Constrained for awhile to obey the powers of the tyrants (cold and darkness), he at last escapes, like the skilful oarsman Dagon, traverses the tempestuous sea of night, and leaps at daybreak in freedom on shore. He destroys the oppressor who kept him in bondage. But the sun, like Siegfried, Sigurd, and the Sleeping Beauty, is not invulnerable, and, being betrayed, is bound by the frost giants or slain by the demons of darkness. Thus 'Allfadir,' really no other than Odin, who himself must perish, and whom at the day of doom the wolf, the Fenriswolf, was to swallow at one gulp."† And, again, we have among the Swiss legends the tradition of the Three Tells. "The three founders of the Helvetic confederacy are thought to sleep in a cavern near the Lake of Lucerne. The herdsmen call them the Three Tells, and say they lie there in their antique garb in quiet slumber, and, when Switzerland is in her utmost need, they will awaken and regain the liberties of the land."

Thus we see that the mysterious disappearance of a great

* "Algonquin Legends." Leland, p. 133.

† "Chips from a German Workshop." Max Müller, p. 194, and p. 232.

hero, who is to return at the right moment, and lead his people to victory and happiness, is a popular myth all over the two continents. Among the Iroquois it is Ioskeha, Wasi to the Cherokees, Tamoi to the Caribs, and among the Algonquins it is Michabo.

He is said "to sleep through the winter months, and at the time of the falling leaves, by way of composing himself for his nap, he fills his great pipe and divinely smokes," or, as Dr. Brinton expresses it, "in the autumn, in the moon of the falling leaf, ere he composes himself to his winter's sleep, he fills his great pipe and takes a godlike smoke." The balmy clouds float over hills and woodlands, filling the air with the haze of the "Indian Summer." *

Among the Hiawatha legends is a quaint Odjibwa allegory of Winter and Spring. Schoolcraft relates it as follows:—

An old man was sitting in his lodge by the side of a frozen stream. It was the close of winter, and his fire was almost out. He appeared very old and very desolate. His locks were white with age, and he trembled in every joint. Day after day passed in solitude, and he heard nothing but the sounds of the tempest, sweeping before it the new fallen snow.

One day, as his fire was just dying, a handsome young man, named Seegwun, approached and entered his dwelling. His cheeks were red with the blood of youth, his eyes sparkled with animation, and a smile played upon his lips. He walked with a light, quick step. His forehead was bound with a wreath of sweet grass in place of a warrior's frontlet, and he carried a bunch of flowers in his hand.

"Ah, my son!" said the old man, "I am happy to see you. Come in. Come, tell me of your adventures, and what strange lands you have been to see. Let us pass the night together. I will tell you of my prowess and exploits, and what I can perform. You shall do the same, and we will amuse ourselves."

He then drew from his sack a curiously-wrought antique pipe, and, having filled it with tobacco, handed it to his guest. When this ceremony was over the old man spoke as follows:—

"I blow my breath, and the streams stand still. The water becomes stiff and hard as clear stone."

"I breathe," said the young man, "and flowers spring up all over the plains."

"I shake my locks," said the old man, "and snow covers the land. The leaves fall from the trees at my command, and my breath blows them away. The birds rise from the water and fly to distant lands. The animals hide themselves from my breath, and the very ground becomes as hard as flint."

"I shake my ringlets," said the young man, "and warm showers of soft rain fall upon the earth. The plants lift up their heads out of the earth; my voice recalls the birds; the warmth of my breath unlocks the streams; music fills the groves wherever I walk, and all nature rejoices."

At length the sun began to rise. A gentle warmth came over the place. The tongue of the old man became silent. The streams began to murmur, and the fragrance of flowers scented the air.

Daylight showed Seegwun that he had been entertained by Peboan with the icy visage. Streams began to flow from his eyes. As the sun increased he grew less and less in stature, and soon had melted completely away. Nothing remained on the place of his lodge fire but the miskodeed, a small white flower (*Claytonia virginica*) with a pink border, which is one of the earliest species of northern plants.†

In conclusion, we may note the account of how Glooskap found the Summer, which appears to be the more complete form of the legend of Peboan and Seegwun.

"In the long time ago when people lived always in the early red morning, before sunrise, Glooskap went very far north, where all was ice. He came to a wigwam. Therein he found a giant, a great giant, for he was Winter. Glooskap entered; he sat down. Then Winter gave him a pipe; he smoked, and the giant told tales of the old times.

"The charm was on him; it was the frost. The giant talked on and froze, and Glooskap fell asleep. He slept for six months like a toad. Then the charm fled, and he awoke. He went his way home; he went to the south; and at every step it grew warmer, and the flowers began to come up and talk to him.

"He came to where there were many little ones dancing in the forest; their queen was Summer. I am singing the truth; it was Summer, the most beautiful one ever born. He caught her up; he kept her by a crafty trick. The Master cut a moose-hide into a long cord. As he ran away with Summer, he let the end trail behind him.

"The fairies of Light pulled at the cord, but as Glooskap ran the cord ran out, and, though they pulled, he left them far away. So he came to the lodge of Winter—but now he had Summer in his bosom—and Winter welcomed him, for he hoped to freeze him again to sleep. I am singing the song of Summer.

"But this time the Master did the talking. And ere long the sweat ran down Winter's face, and then he melted more, and at last he had melted quite away, as did the wigwam. Then everything awoke: the grass grew, the fairies came out, and the snow ran down the rivers, carrying away the dead leaves. Then Glooskap left Summer with them, and went home."

## AMERICA'S GROWTH.*

ERRONEOUS ideas are entertained by most Englishmen and by many Americans about the relations existing between that portion of the great English-speaking community which remains associated with Great Britain, either at home or in her colonies, and that other portion, now the main body, which prefers to have its own system of government apart from the old country. That the diversity between the two systems of government differentiates these two portions of communities not only English-speaking, but to all intents and purposes British, into different nations, must of course be admitted; but that there ought to be any feeling apart from taste or convenience which should cause any member of either of these communities to attach himself preferably to one rather than to the other seems, if we consider the question as it actually stands at present, absurd on the face of it. During a period extending over about a century and a half, Britons (themselves a race of settlers in Great Britain) settled in various parts of North America, without any feeling that they were deserting their own kindred in thus making homes for themselves elsewhere. Gradually as they grew in numbers, as they gathered together into cities, and as their wealth increased, they appeared of greater importance in the eyes of the home government, as being better worth taxing to

* "Myths of the New World," Brinton, p. 177.
† "Hiawatha Legends," Schoolcraft, p. 90.

* "Triumphant Democracy; or, Fifty Years' March of the Republic." By Andrew Carnegie. London: Sampson Low, Marston, Searle, & Rivington.

supply the sinews of war for contests in Europe. It was not, however, as enemies of Great Britain that they resisted, but in self-defence against the injustice of rulers who regarded nations as a sort of property. They were not Americans fighting against Britons, but Britons in America fighting for independence against the rulers of Great Britain at home. If national rivalry at all were in question, one might say, considering that the king of Great Britain was of almost undiluted German blood, and that besides Britons only Germans fought against the independence of our British race in America, that the contest was between Britons and Germans. This, however, would be to exaggerate the difference between the actual character of the War of Independence and what that war is commonly held to be, alike by Britons here, and by men of our own British stock in America; and no exaggeration is needed. The mistake actually made is marked enough. It prevents the average Briton from glorying in the noble effort by which our people more than a century ago achieved victory for their just cause; and it prevents the average American from recognising that it was while Americans were British in name as well as in fact (for this they have always been) that they achieved the independence which is the greatest glory of one of these nations, and should be the greatest glory of both.

America being derived, as we know she was, from an essentially British stock, and being essentially British in blood and character, the Briton who finds it suit his purpose to join the American community has no reason for regarding himself as debarred from so doing by any claims of the home community upon him. There are, in fact, no such claims now any more than there were in the case of those who went out as colonists to America in the seventeenth and eighteenth centuries. Nor should an American who finds it convenient to make the old country or one of its colonies his home, consider that he is deserting his own people any more than a Virginian or a New Englander would so think, who found it convenient to return to England in the old days, before the War of Independence had definitely separated the British race into communities having different governments. The only kind of patriotism which can be regarded by reasoning men as a virtue, is loyalty to the people; loyalty to a form of government and loyalty to a tract of land are qualities appropriate only to semi-savage races.

If all Britons believed in monarchy, not only as a system which it would be inconvenient to change, but on principle, and if all Americans were equally earnest in the belief that a man is necessarily degraded who remains within a community ruled (even nominally) by a sovereign, the case would doubtless be very different. It would then be a point of patriotism for a Briton to remain British and for an American to remain American. Or if war were likely, one might almost say if war were possible, then—as war, essentially degrading, necessarily brings with it many unpleasant conditions—it might be a sort of duty for Americans and Britons, alike, to remain severally under their own respective flags. But Britons are not monarchist nor Americans republican in that foolish sense. The Briton knows that he has taken nearly all effective evil out of monarchy—for all at least who respect the dignity of their manhood. (As for the rest, those who being free prefer to ape slavery and having the right to stand erect fall to boot-licking—with an appetite—it matters little what form of government *they* have.) The American, in like manner, knows that if he and his fellows willed they could substitute a king for a president, yet give up no atom of their freedom or their self-respect.

The Briton, even if he call himself (not being concerned about trifles) a subject, is as free from all real subjection as the American citizen. If he speaks with esteem or respect of any king or queen who chances, as has happened, to be virtuous and intelligent—or even both—it is as men or women he regards them, and his respect implies no admission that the original atrocities were just by which the English monarchy was founded and the people temporarily brought into real subjection. Still less does such reasonable esteem for a king or queen chancing to be worthy of esteem imply approval of the wars, the iniquities, or the immoralities by which nearly all the rulers of this country afflicted and offended the people in past times. The American in like manner knows that neither his own people nor the kindred people here would suffer such iniquities or anything approaching to them to be perpetuated, even though America should choose to give to its government the title of monarchy, or though Great Britain still allows the name to remain after the evil of it is dead.

As for war, if war is possible between two such communities as Great Britain and America, then the shame of that is such as to overshadow any such shame as might belong to being on one side or the other side in a contest which would be unutterably degrading to both.

These remarks have been suggested by the reading of Mr. Andrew Carnegie's interesting work, "Triumphant Democracy." It brings before the reader more thoroughly than any book we have yet seen the importance of the ethnic question in considering the fortunes of a nation, and the comparative insignificance of the particular form of government which the nation may find convenient. Mr. Carnegie calls his book "Triumphant Democracy," but, so far as we can see, he in no sense shows that democracy, as such, has had much to do with the progress of America. Democracy regarded in its negative aspect has been, doubtless, all-important in determining the fortunes of the States. But this implies only the converse proposition that a nation which begins its career in a state of actual subjection to more or less rapacious rulers, and their plunder-loving followers, cannot possibly make rapid progress until it has shaken itself free and replaced a state of real subjection by one of practical citizenhood. If the progress of America during the last century has been almost incomparably more rapid than that of the old country, it has not been because of any inherent virtue in democracy, but because the progress of America as a nation has not been hampered by oppressive misgovernment. There is curious evidence of this in the degeneracy of the present race of politicians in America. England would be ruined in a couple of generations if her politicians were as worthless as those who have attained power in America (we make no comparison in regard to English statesmen, for there are no statesmen in America).

But what good fortune it is to a nation to be let alone, to have a fair start in national life instead of having to struggle out from under a dead weight of oppression, this book shows well. We commend it to the careful study of those who imagine that they have settled the whole question by pointing to municipal bribery at New York, corrupt State legislation at Albany, and iniquitous political life at Washington. Compare the nation fairly and truly pictured in this book, a nation about as much to be judged by its politicians as England by lords-in-waiting and other flunkeys at court, with the America of a hundred years ago—extending the comparison so that while the former is compared with the England of to-day the latter is compared with the England of a hundred years ago—and it will be felt, we think, that America must have had some immense advantage in the race. What that advantage has been cannot well be doubted. Democratic government has done little for America, and of late the little that her politicians have

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done has been harmful; but the power and the right which Americans possess to go their own way, and their manful determination to hold that right, let Governments, their own included, do what they will, have been all-in-all to the great nation of our kinsmen across the Atlantic. Even the possession of the suffrage by persons utterly unfit to vote on any higher question than the paving of a back alley has not been able to do one-thousandth part of the harm one might have expected.

The illustrative map, taken from an old edition of the "Encyclopædia Britannica," is as strongly suggestive of

what America was when that map was thought sufficient, as is the letterpress of that work so far as it relates to the United States. Not one page in all is devoted to the description of the infant nation which had just begun to run alone. Except for a line or two about Virginia, one might suppose the States were still British colonies, though the edition bears date 1783. Not a single line implies that there had been any contest worth mentioning on the other side of the Atlantic. The map was manifestly drawn to correspond with this feeling of contemptuous indifference for the young nation.

America was, indeed, but a small nation then, though it deserved the respect and sympathy of Great Britain, since, while as yet it was not America but a community of British colonists, it had maintained its just claims to independence against the full strength of the mother country. But consider what it is now! The three millions of 1770 had grown to thirteen millions in 1830, and now to nearly sixty millions—"more English-speaking people than exist in all the world besides," more than the whole population of the United Kingdom *plus* twice the population of the British colonies. In 1850 the total wealth of the United States was 1,686,000,000*l.*, that of Great Britain being 4,500,000,000*l.*; now the wealth of Great Britain is about 9,000,000,000*l.*, or almost exactly double what it was in 1850; but the wealth of the United States had risen in 1880 to 9,790,000,000*l.*, and is now nearly 11,000,000,000*l.* In 1850 it was hardly worth while to mention America's manufactures in the same breath with those of Great Britain; in 1880 British manufactures amounted to 818,000,000*l.*, those of the States to 1,112,000,000*l.*, nearly half as much as the manufacturing wealth of the whole of Europe. As our author well puts it, though Great Britain manufactures for the whole world, while America is gaining only the control of her own markets, British manufactures in 1880 had not two-thirds the value of those of the century-old republic. The annual savings of America are 210,000,000*l.*, exceeding those of the United Kingdom by 50,000,000*l.* and those of France by 70,000,000*l.* In comparing the American carrying business with that of Great Britain, we seem to find the younger country behind, since the American shipping amounts to but nine millions of tons, that of Great Britain to eighteen millions. But when

we consider the internal commerce between the States we recognise a difference the other way. This internal commerce exceeds the entire foreign commerce of Great Britain and Ireland, France, Germany, Russia, Holland, Austro-Hungary, and Belgium combined. The Pennsylvania Railroad system, alone, transports more tonnage than all our British merchant ships!

These are but a few samples of the wonders which Mr. Carnegie—a Scotsman by birth, and not a politician, but a man of business—has to tell about the development of America. We commend his book to the careful reading of men who think; for party men, or men otherwise liable to be swayed by mere prejudice, the work will be pleasing or irritating, according to the direction in which their proclivities tend. But for those who look hopefully, or at least longingly, to the future of the human race, it is a work whose every page will be full of meaning.

## EVOLUTION OF LANGUAGE.

By Ada S. Ballin.

### VII.—THE ORIGIN OF ROOTS.

WHEN discussing the origin of the natural sign language * I showed how its words are formed by the reproduction of the natural signs of emotion, by the imitation of the characteristic aspects, movements, or uses of objects, and for brevity by the representation of marks characteristic of certain objects. Similarly words may originate by imitation of:—

1. Natural sounds, which are the outward expression of sensations or emotions.

2. The sounds produced by animals, which are, as it were, marks each characteristic of the animal that utters it.

3. The sounds produced by the movement of inanimate things, and in the use of objects by man.

In considering the first class we find that certain sounds, which are called interjectional, are common to races speaking widely different languages, and they are so because they are the natural and instinctive expression of feelings which are common to all mankind. Such are sighs and groans, as Ah! Oh! which, pronounced in various tones, express very different feelings, as, for example, all shades of grief, pain, surprise, admiration, and even pleasure. The words *woe*, Saxon *wa*, Latin *væ*, Greek *ovai*, Welsh *gwae*, German *Weh*, Dutch *wee*, Swedish *ve*, Hebrew *hoi*, are imitative of the sounds of sighing which we find in the emotional interjections: *heigho*, Wolof language of Africa *hhihhi*, Hebrew *Ahâh*, *hâh*, and *hô*. Another set of derivatives from the same source may be seen in our *hi!* stop! *way! whoa!* when addressed to horses; Challam Indian *hôi!*—which may all be taken as meaning "There's danger ahead, so stop," or "It will be worse for you if you don't stop."

In Chinese plays of the Yuên dynasty *ŭ* and *wŭ* are used as exclamations or calls to inferiors, as *ŭ-nâ fû-jîn pŭ-yaû tí-k'ŭ*, "O woman! do not cry and weep"; *wŭ-nâ kí-shŭ-tî!* Halloa! Postman!" In the Shi-King *hŭ-hŭ!* an exclamation arising from pain, is used as "Oh! Alas!" The Hebrew *hoi* or *oi* is used, 1, of lamentation; as *alas!* 2, of threatening, as: "*Woe* to the sinful nation," Isaiah i. 4, like *ho! woe! hei!* Greek *oi*, Latin, *væ!* and also, 3, of admonition, like *ho! heus! he! Hoi erets*, &c. (Isaiah xviii. 1), translated, "Ah, the land, &c." *Hó*, in Chinese, is used as a noun, "Misery."

* Knowledge, vol. vii., p. 516.

A curious instance of the introduction into language of a sound produced by an emotional expression is that of the sound *o*. In Japanese *o* is used as a prefix of honour, as: *mets'ké*, a spy (literally eye-fixer). *O mets'ké*, a princely or imperial spy, *Oo mets'ké* the spy in chief. *Oo* also, by a natural transition, becomes the interjectional adjective "great." The Iroquois of North America form compound words with the sounds *io*, indicative of admiration; in Mohawk, *Garonta* means a tree; *Garontio*, a beautiful tree; and *Ohio*, means a beautiful river. The similar usage of the sound, among such widely different peoples, may be accounted for by the fact that when anyone is startled or astonished the mouth is widely opened to draw a deep breath, and so be ready for action. When the next expiration takes place the mouth is slightly closed, and the lips protruded, so that the sound of a long *o* is produced. I remember that, when I was a child, if fireworks were being displayed, at each discharge a sort of deep groaning, "Oh!" invariably came from the crowd; but now that fireworks are so frequently seen, that sound is rarely heard, or, if at all, only from one or two voices, instead of being, as formerly, unanimous.

Darwin observed that when on a quiet night some rockets were fired from on board the *Beagle*, which was anchored in a little creek at Tahiti, as each rocket was let off there was absolute silence, invariably followed by a deep groaning *Oh*, resounding all round the bay. When pain is felt with surprise, the tendency to contract all the muscles of the body which accompanies pain causes the lips to be drawn back, and the sound, becoming higher, assumes the character of *Ah!* or *Ach!* The Chinese interjection to indicate pain is *ai-ai* (cf. Italian, *ahi*, in *ahimè*, woe 's me). Mr. W. Mathews says the North American Indians express astonishment by a groan, which doubtless resembles the sound described by Darwin. The deaf, dumb, and blind Laura Bridgeman, to whom I have previously referred, when amazed, rounds and protrudes her lips, opens them and breathes strongly, making a sort of sound, *ho-o-f-f*, for wonder. Indeed, the lips are often protruded in astonishment, and the same expression has been observed in the chimpanzee and orang. Mr. Winwood Read states that the negroes of the west coast of Africa under the same emotion protrude their lips and make a sound like *heigh-heigh*. Among the Chinese *ai-ya* (cf. Latin *eja*) is an expression of joy and surprise.

If the mouth is not much opened whilst the lips are considerably protruded, the result is a blowing, hissing, or whistling sound, and Mr. R. Brough Smyth informed Darwin that an Australian from the interior on being shown an acrobat turning head over heels "was greatly astonished, and protruded his lips, making a noise with his mouth, as if blowing out a match." Mr. Bulmer says the Australians make an exclamation of surprise *korki*, "and to do this the mouth is drawn out as if going to whistle." Europeans whistle when surprised, Englishmen utter an exclamation written *whew*, and Mr. Mansel Weal saw a Kaffir girl who, on hearing of the high price of an article, "raised her eyebrows and whistled just as a European would." * *Yâ* and *ā* in Chinese denote wonder and astonishment, while *hí* is an exclamation of admiration used in poetry, as: *pî meî jîn hî!* that beautiful person!

When an unpleasant odour is encountered, an instinctive action takes place by which the nostrils are closed, the lips narrowed almost to closure, and a rapid expiration made, in order to get rid of the noxious particles. In so doing the sound of *f* is produced; the same gesture is frequently made when the feeling of disgust or displeasure is mental. Thus Laura Bridgeman when displeased would make the sound *f*, *ff*, or *fi*. The same sound may be found in our

* See Darwin's "Expression of the Emotions," p. 285 *et seq.*

expression, "Fie! for shame," or in the exclamation commonly written *faugh!* A more explosive action in blowing through the mouth as if to get rid of an offending object will produce the sound *pooh*, *pish*, or *pshaw*, often written as exclamations, and to this origin may be traced a number of words in many different languages. Such, for example, is the Sanskrit *pûy*, to become *foul* (whence Latin *putridus*, our *putrid*), *piy* and *pîy*, to revile, hate. The Zulu says of turned-off meat, "the meat says *pu*" (stinks). In Timorese *poöp* means putrid; Quiché *puh*, *poh* signifies corruption—our *pus*; *pohir* is to turn bad, *puz* rottenness; Hebrew *puahh*, to exhale as odours, blow (cf. Malay *puput*, to blow), utter, pant, rail against (cf. Maori *puku*, to pant). From the same source comes also the verb to *puff*, with all its derivatives, even to powder-*puff*. From the idea of a *puff* of smoke comes the Australian *pooyu*, smoke; Quichua *puhucumi*, to light a fire; *puhuya*, a cloud; Zulu *fu*, cloud. In Zulu also the word for thorax is *fuba*, *pupuma* means to bubble, boil, and very many other derivatives from the same instinct-sound, if I may so call it, might be cited. The English *spue* and *spit* have similar origins, and the sound of forcible ejection from the mouth is heard in Tahitian *Tutua*, to spit. In Chinese *p'ì* is used to express contempt and defiance, and is very often equivalent to "begone!"

Our word *chuckle* is imitative of the sound uttered as an expression of inward amusement and glee, an instinctive sound, as proved by its being made by Laura Bridgeman. The Zulu *gigiteka* is used in the same way as our *giggle*; *hee-hee* or *ha-ha* becomes a word meaning to laugh; Sanskrit, *hahh*. The Chinese make a word *hì-hì* expressive of laughter, and *hì* is used in the sense of "to be glad." Zulu *halala*, to utter a sound of exultation, corresponds to the Hebrew *halal*, to shout, give praise, introduced into English in the form Hallelujah! which means literally "Praise Jah," or Jehovah, and to our *hurrah*.

Interjections may become words: thus from *o*, the answer to a call or cry used by the Gallas to drive cattle, two verbs have been formed—*oarda*, to answer, and *ofa* to drive.

The function of breathing is that which, all over the world, has been and is considered the most significant of life. To say a person has ceased to breathe is equivalent to saying that he is dead. The Hebrew root *hhayah*, to live, is imitative of breathing, and from it come many derivatives. Another form of it is *hhivvah*, to breathe out, declare, show; from it come also *hhavvah*, life, the name of the first woman, Eve; the more-used plural form *hhayim*, life; and *hhayah*, living thing. Another very important form of the verb to breathe is *hayah* to exist, to be, to become, happen; also seen in *havah*, which takes on, moreover, from the idea of breathing after, the meaning to desire, long for; *havvah*, desire, cupidity, or *avah* (with *vav*), to long for, *avvah*, desire, lust—in a spiritual sense, pleasure, will. Closely connected with the latter is the verb *abah*. Compare Latin *aveo*, to be willing, to wish, desire, long for, and the much-used Semitic root *ahab*, to desire, love.

The Sanscrit root *bhu* to be, must also have originated in the imitation of the sounds of breathing; its form closely resembles the above Hebrew words, and from it are derived the Latin *fu* "to be," existing only in the perfect tenses—Welsh *bod*; German *bin*, *bist*, &c.; side by side with *sein*, *ist*, &c.; Saxon *beon*, our English to *be*. To *have* and to *happen* are probably derived from the same origin in the imitation of breathing sounds; the Welsh *hapiaw* is to happen, to befall, to have luck; *hàp* or *hap*, luck, chance, that which falls or comes suddenly, allied with Dutch *happen*; Welsh *hafiaw*, to snatch; Norman *happer*, to seize; French *happer*, to snap or catch (a sound which may be heard when a dog catches in its mouth anything thrown to it). In Spanish *haber* means to *have*, to *happen*, to befall, to take, to possess; thus uniting the meanings of the Latin *cap*, and *hab*, which are apparently cognate words. To our *have* correspond Saxon *habban*, Gothic *haban*, German *haben*, Dutch *hebben*, Swedish *hafra*, Danish *haver*, Portuguese *haver*, Italian *avere*, French *avoir*; and, as mentioned above, Welsh *hafiaw*, to snatch or seize hastily, as well as *hapiaw* to *happen*. Closely allied with this is our slang term *cop*, "to take," with its derivative *copper*, "a policeman."

The Hebrew word *ruahh*, meaning air in motion, wind, and which to my ear is distinctly imitative, applied also to breath of the nostrils, *snuffing*, snorting of *anger*, like *aph* from *anaph* to breathe, comes to be used in the same way as the Latin *spiritus* (literally breathing), as spirit, soul, vital principle; and *nêphêsh*, breath, from the root *naphash* is similarly used. *Anaph* (whence *aph*, anger), to breathe, especially through the nostrils, is used in the sense of to be angry, and is imitative of the hard breathing of anger. The root *ruahh*, to breathe, is cognate with *puahh* to blow, and *nuahh* to respire, breathe quietly, hence to rest. It is used in the same way as in the Germanic languages the root *huch*, *hugh*, Allemanic *hughi*, Swedish *hugh* = Hebrew *ruahh*, spirit. The Hiphil form of the verb *ruahh* is *hêriahh*, to smell, similar to the German *riechen*, in smelling, the air being drawn in and expired through the nostrils. Followed by a particle meaning *in*, it comes to mean smelling with pleasure, to delight in (Isaiah xi. 3, "His delight shall be in," &c.). *Rêahh nichoahh*, "a sweet savour," also means something pleasant in a moral sense. Another derivative of the word *ruahh* is *ravahh*, to be spacious, ample, loose; hence, *révahh*, space (Genesis xxxii. 17), relaxation, freedom from distress (Esther iv. 14). Imitative of the sound of hard breathing, we find *shaaph*, to pant, catch at with open mouth; hence, by an easy transition, to hasten. Cognate to this root are *shuph*, to gape upon—hence, lie in wait for; *nashaph*, to blow—whence *nêsheph*, evening twilight, when the cool breeze blows, and, further, darkness, night (Isaiah v. 11), or morning, when there is also a cool breeze (Job vii. 4), *nashaph* being only another form of the more largely used root *naphash*, for, as we have seen, the transposition of sounds is a very common linguistic change. These roots may be compared with the German *schnauben*, to breathe heavily, pant for; *schnaufen*, to puff and blow; and *schnappen*, to *snap*, gasp, catch at. We find the same idea in *puahh*, to breathe, blow, blow out; also to utter and rail against, in which sense it is connected with the word *péh*, Arabic *fu*, mouth. In Hebrew the sounds *p* and *f* are interchangeable and represented by the same letter of the alphabet; for example, *péh* with the prefix *l*, meaning "to," becomes *lephi*, "according to." *Puahh* is also closely connected with the word *naphahh*, to blow, breathe, kindle (as a fire); cf. German *fachen* and *anfachen*, and *yaphach*, used in the Hithpael form (Jeremiah iv. 31), to pant or sigh deeply.

## OUR PUZZLES.

THE Puzzles for last month in their simplest form are dealt with in what follows:—

Puzzle XXV. *To build up four tetrahedrons and six square-based pyramids having equal triangular faces into a square-based pyramid.*

Set four of the pyramids so that their square bases AEKH, EBFK, KFCG, and KGDH, fill the square ABCD as shown in fig. 1, their vertices being at L, M, N, and O.

Into the space EMKL fit a tetrahedron of which EK and LM are opposite edges, and in like manner fill in the spaces KMFN, KNGO, and KOHL. Into the space LMNO fit a pyramid

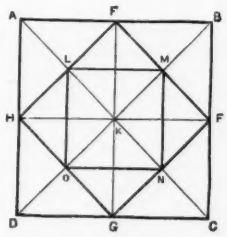


FIG. 1.

apex downwards, and on its base LMNO add another pyramid. We thus get the pyramid ABCD having equilateral triangular faces AKB, BKC, CKD, and DKA.

Cor. 1. It is obvious that we can in like manner set nine pyramids to fit a square base; and fit in between them 12 tetrahedrons; and then fit in 4 pyramids apex downwards, whose 4 bases will give a surface such as ABCD, fig. 1. On this we build up as before a pyramid in which are 6 pyramids and 4 tetrahedrons. We thus build up 19 pyramids and 16 tetrahedrons into a pyramid on a square base and with equilateral triangular faces.

Cor. 2. So can we build up 16 pyramids apex upwards +9 apex downwards +9 apex upwards +4 apex downwards +4 apex upwards +1 apex downwards +1 apex upwards, into a square-based equilateral-faced pyramid, by fitting in 24 tetrahedrons in lowest layer, 12 in the 2nd, and 4 in the 3rd—making 44 pyramids and 40 tetrahedrons in all.

Cor. 3. And manifestly, if a square base has a side containing an edge of a pyramid or tetrahedron, $n$ times the number of pyramids and tetrahedrons required to build up a pyramid on that base will be as follows :—

$$\text{No. of pyramids} = n^2+2[(n-1)^2+(n-2)^2+\ldots+9+4+1]$$
$$= n^2+\frac{n-1}{3}(2n-1)n$$
$$= \frac{n}{3}(2n^2+1)$$

(Observe that if $n$ is not divisible by 3, $2n^2+1$ is necessarily divisible by 3; for in that case $n$ is of one of the forms $3r\pm1$, and $\therefore 2n^2+1$ is of one of the forms $18r^2\pm12r+3$.)

$$\text{No. of tetrahedrons} = 4[(1+2+3\ldots+n)+(1+2+3+\ldots+n-1)+\ldots+6+3+1)]$$
$$= 4[(1+2+3+\ldots+\overline{n-1})+(1+2+3+\ldots+\overline{n-2})+\ldots+10+6+3+1]$$
$$= \frac{2}{3}(n-1)n(n+1)$$
$$= \frac{2n}{3}(n^2-1)$$

(Obviously if $n$ is not divisible by 3, $n^2-1$ must be divisible by 3, its two factors being $n+1$ and $n-1$, one of which must be a multiple of 3 when $n$ is of one of the forms $3r\pm1$.)

When $n$ is very large, we see that the numbers of the tetrahedrons and pyramids approach a ratio of equality. The number of pyramids, however, always exceeds the number of tetrahedrons by $n$. Thus, if $n = 1{,}000$, or there are a million pyramids in the base layer, the entire pyramid, which will require $\frac{2\,000}{3}$ (999,999), or 666,666,000 tetrahedrons, will require $\frac{1\,000}{3}$ (2,000,001), or 666,667,000 pyramids—*i.e.*, 1,000 more pyramids than tetrahedrons.

PUZZLE XXVI. *To build up six octahedrons and eight tetrahedrons having equal square faces, into a single octahedron.*

It is obvious that if AEKH, EBFK, KFCG, and KGDH, fig. 1, represent octahedrons projecting below as well as above the plane ABCD, a fifth octahedron LMNO, with four tetrahedrons in the previous case, will complete the semi-octahedron ABCDK *above* the plane ABCD, while a sixth octahedron and four tetrahedrons *below* this plane, will complete the other semi-octahedron, or build up the entire octahedron.

Cor. 1. Clearly we can build up 9 octahedrons+4 octahedrons above +4 below the first nine=1 octahedron above +1 below, with 12 tetrahedrons above +12 below the nine octahedrons +4 above +4 below, to make a single octahedron, using in all 19 octahedrons and 32 tetrahedrons.

Cor. 2. Similarly can we build up a single octahedron of 44 octahedrons and 80 tetrahedrons, simply dealing with the case as in Cor. 2 on the previous pu zle, but using as many tetrahedrons below as above the square base of the upper semi-octahedron, and octahedrons instead of semi-octahedral pyramids throughout.

Cor. 3. And manifestly, if the edge of the containing octahedrons is $n$ times as long as any of the equal edges of the component octahedrons and tetrahedrons, the numbers of these solid figures will be as follows :—

$$\text{No. of tetrahedrons} = \frac{n}{3}(2n^2+1),$$

$$\text{No. of octahedrons} = \frac{4n}{3}(n^2-1),$$

the number of octahedrons being always less than twice the number of tetrahedrons by $2n$ (or the number of octahedrons always $n$ greater than half the number of tetrahedrons). But when $n$ is very great, the number of tetrahedrons becomes very nearly twice as great as the number of octahedrons.

NOTE. I propose to leave till next month the inquiry into the way in which, when space is filled in with octahedrons and tetrahedrons, or with semi-octahedral pyramids and tetrahedrons, the component solids can be shifted in slices or in strips. One of the puzzles given this month will be found to bear on these points.

PUZZLE XXVII. *To find a semi-regular solid of such a form that any number of such solids, of equal size, can be built up into a single solid without interstices; as a solid may be built up of equal cubes, but within the solid thus built up no shifting or sliding must be possible (as in the case of a cube-built solid) without interruption of continuity.*

I propose to leave the discussion and demonstration of this puzzle to next month, giving for the present only the solution :—

The solid required is a semi-regular dodecahedron. It has twelve faces, each a rhombus or diamond, so that all its

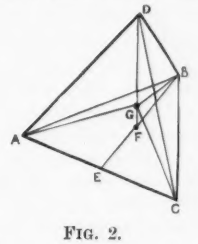


FIG. 2.

edges are equal. The solid angles of the figure are made up of three of the larger, or four of the smaller angles of the

diamond faces. The figure of the rhombus may be defined as having its larger angle equal to that subtended by an edge of a regular tetrahedron from the tetrahedron's centre of figure. Thus, let ABCD, fig. 2, be a regular tetrahedron; BE perpendicular to and bisecting AC; DF perpendicular to BE (EF one-third of BE); FG one-fourth of DF (so that G is the centre of gravity, and of figure, of the tetrahedron ABCD. Join AG, GB, BC. Then AGC, BGC, BGA, are severally

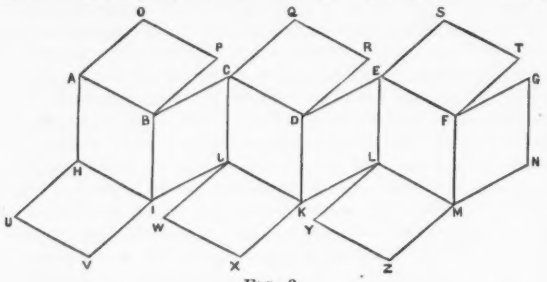


Fig. 3.

halves of the rhombus required; and AGBC is one of the three-planed solid angles of the solid required. It is easy to obtain DG by a geometrical construction; or arithmetically thus, putting the edge of the tetrahedron equal to $2a$:—

$$DG=\tfrac{3}{4}DF=\tfrac{3}{4}\sqrt{DB^2-BF^2};$$

also $DB^2=4a^2$; $BF^2=\tfrac{4}{9}BE^2=\tfrac{4}{3}a^2$;

wherefore $DG=\tfrac{3}{4}\sqrt{\tfrac{8}{3}}a^2=a\sqrt{\tfrac{3}{2}}$ or $\frac{a}{2}\sqrt{6}=1{\cdot}225a$ nearly $=\frac{49a}{40}$ nearly.

Thus DG=AG=BG=CG=AW forty-nine eightieths of AC, AB, BC, or BD.

The diamond faces for our solid can be readily constituted from this known proportion. They have the shape and form in the twelve diamonds of fig. 3, which represents what is

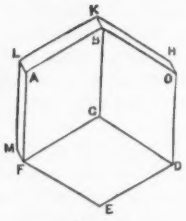


Fig. 4.

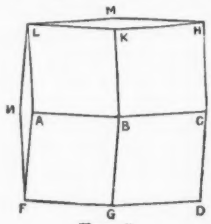


Fig. 5.

called the "net" for the required solid. The student will find it interesting to cut out such a "net" in card, dividing half through the card along AB, BI, HI, &c., and then bending the card into the form of the solid shown, in two aspects, in figs. 4 and 5.

## MATHEMATICAL RECREATIONS.

### OUR PUZZLES.

FOR this month I suggest three puzzles connected with the last three, and also with those which preceded them in March, February, and even January (when the orange-packing puzzles appeared). Any one who studies out the geometrical and arithmetical relations involved in these puzzles will find that he has gone through instructive exercises.

Puzzle XXVIII. *Show how to build up a regular tetrahedron of smaller tetrahedrons and octahedrons having equal triangular faces and edges commensurable in length with those of the built-up tetrahedron. (Simplest form of the problem is to build four tetrahedrons and one octahedron into a tetrahedron.)*

Puzzle XXIX. *A number of equal spherical shells, of highly elastic skin-like material, are filled with a gas which expands energetically when its temperature is raised. They are piled up in pyramids like cannon-balls, and the pyramids enclosed in rigid casings; or they are packed in boxes like the oranges in the January puzzles, remaining all globular and equal. Being then exposed to a constantly increasing temperature, the shells expand, losing their globular form, and eventually becoming everywhere flat-faced. Determine the shapes the shells assume in the middle of the heap, where the pressures around each may be assumed to be uniform. (Near the enclosing casings, of course, the pressures are not uniform.)*

Puzzle XXX. *Six Alpine tourists, three of them men, are nearing the place where they propose to take their midday meal, when one of the ladies asks what they are to do for seats. One of the men, of the kind defined by Dickens as "an ingenious beast," propounds to the other two a plan by which the six alpenstocks of the party can be converted, in a few minutes, into a comfortable and symmetrical structure on which the whole company may be seated. The party have with them plenty of rope (being prudent mountaineers) and a good supply of stout cord. Within less than ten minutes after the arrival of the tourists at their resting-place all six are comfortably seated. What was the ingenious beast's plan? (The alpenstocks are each six feet long.)*

Note.—For reasons not belonging to the domain of mathematics, the three masculine tourists considered it especially desirable that the party should be seated in pairs, each pair in some degree apart from the others. The ingenious one secured this result also.

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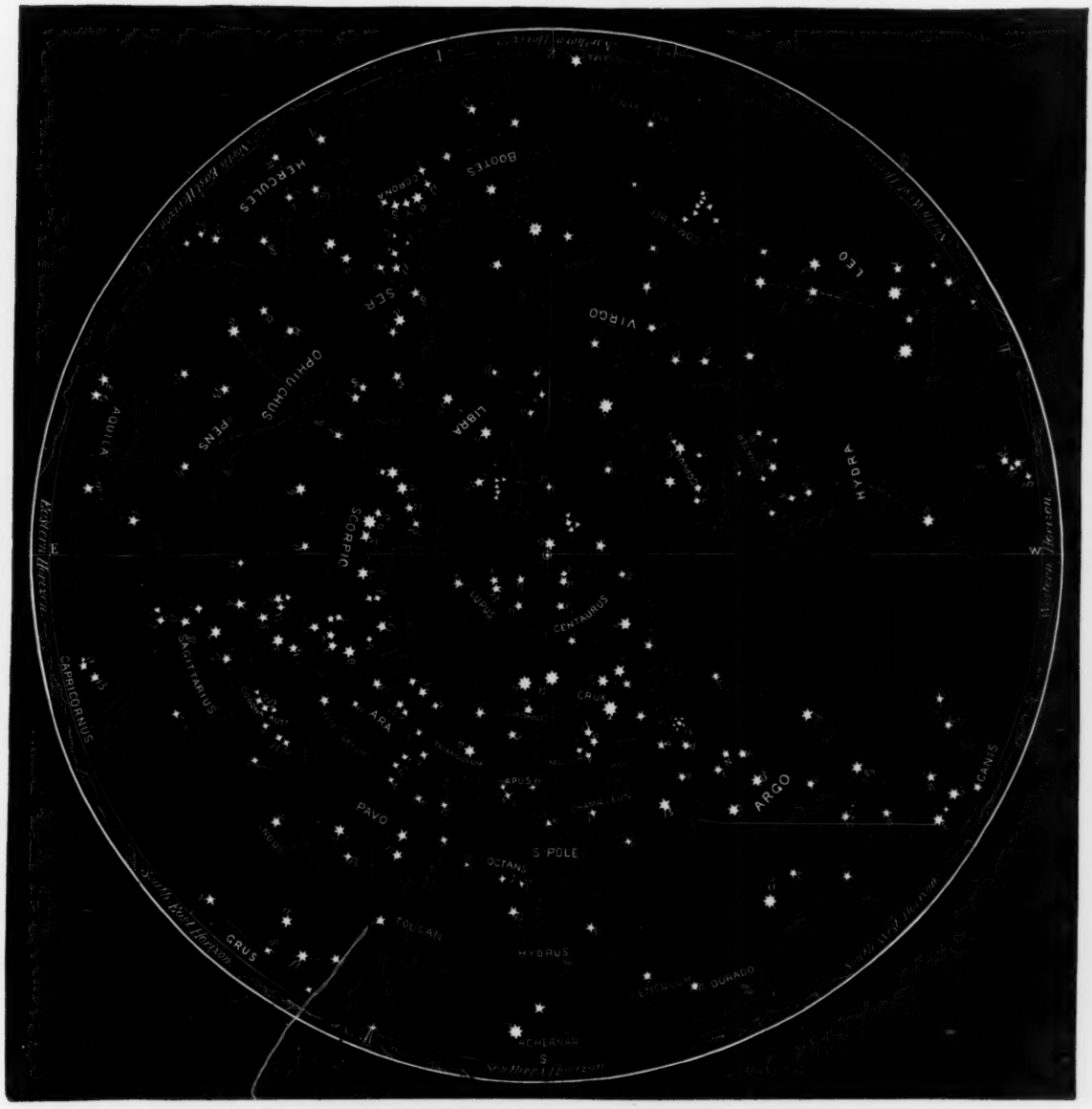
Race Characteristics of the Jews.—Dr. A. Neubauer read a paper recently, before the British Anthropological Institute, on "Race Types of the Jews," the purport of which was to show that there had been considerable intermixtures in the Hebrew race from the time of Abraham down. Joseph married an Egyptian and Moses a Midianite; David was descended from a Moabitess, and Solomon was the son of a Hittite woman. So we read of the non-Jewish women in contact with the Israelites, and undoubtedly the proselytes increased the mixture of races by marrying Jewish women. Moreover, some quite marked differences prevailed in the Middle Ages, and still exist, between the Jews residing in different nations. Mr. J. Jacobs, in a paper "On the Racial Characteristics of Modern Jews," took a different view. Regarding only the Askenasian Jews, who form more than nine-tenths of the whole number, he pointed out as among their characteristics fertility, short stature as compared with Europeans, and narrow chests, brachycephalic skulls, darker hair and eyes than those of any nation in Northern Europe (though nearly one-fifth of the Jews have blue eyes, and they have nearly twice as many red-haired individuals as the inhabitants of the Continent), and a peculiar cast of countenance. He pointed out that the purity of the race depended on the number of proselytes made by the Jews in ancient and Mediæval times. The earlier proselytes, before the foundation of Christianity, were mostly fellow-Semites, and would not affect the type, while the numbers made afterward were too small to modify the race. A considerable number of Jews, the Cohens, were not allowed to marry proselytes, and must consequently be tolerably pure. Mr. Jacobs's general conclusion was therefore in favour of the purity of the Jewish race.

## THE SOUTHERN SKIES.

MAP VI.—For March, April, and May.




The Night Skies in the Southern Hemisphere (Lat. 46° to 24° S.)

and the

Southern Skies in England (Upper Half of Map only) at the following Times:

| | | | |
|---|---|---|---|
| At 1 o'clock, morning, April 7. | At 11.30 o'clock, night, April 30. | At 10 o'clock, night, May 22. | At 8.30 o'clock, night, June 14. |
| „ 12.30 „ „ April 14. | „ 11 „ „ May 7. | „ 9.30 „ „ May 30. | „ 8 „ „ June 22. |
| „ Midnight, April 22. | „ 10.30 „ „ May 15. | „ 9 „ „ June 7. | „ 7.30 „ „ June 30. |

### SOUTHERN SKIES FOR JANUARY.—A Correction.

The dates for the January map, p. 63, were wrongly given, corresponding to the maps of my "Constellation Seasons" (now out of print) not, as they should, to those which form my "Stars in their Seasons." The proper dates and hours for the January map are as follows:—

| | | | |
|---|---|---|---|
| At 1 o'clock, morning, Jan. 7. | At 11.30 o'clock, night, Jan. 29. | At 10 o'clock, night, Feb. 21. | At 8.30 o'clock, night, March 16. |
| „ 12.30 „ „ Jan. 14. | „ 11 „ „ Feb. 6. | „ 9.30 „ „ March 1. | „ 8 „ „ March 23. |
| „ Midnight, Jan. 22. | „ 10.30 „ „ Feb. 14. | „ 9 „ „ March 8. | „ 7.30 „ „ March 30. |

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## THE ONE-SCALE ATLAS.

WE give another map of this series, reserving an account of the method in which the sphere has been divided, and each map projected, till our space is less crowded.

## THE NEW COMETS.*

By Richard A. Proctor.

ALREADY the year 1887 has three comets on its record, one of which promises to be conspicuous. Small comets, indeed, are found to be so common that we must expect soon to hear of cheaper rates than are at present proffered, somewhat to the lowering of cometic dignity, for their discovery. When prizes were first offered for comet-finding, the value of the prize ran, unless I mistake, to 100*l*. Now, ten or twenty comets may be discovered for less money, and what was thought fair work for a year is now accomplished in less than a month.

The discovery that comets of the smaller type are so numerous is, however, important in itself, though none of the small comets recently discovered have presented any features of interest. Whatever theory is eventually accepted respecting comets must give an account of their great numbers, and it will be found that this is a criterion of no slight significance. Combined with what has already been discovered regarding comets and meteors (the kinsfolk of comets), this discovery goes far in my opinion to indicate the true origin and meaning of these interesting bodies.

The trouble about comets and meteors of late has been that the students of astronomy seem unable to keep count at one and the same time of all the known facts. They insist on starting theories which will account excellently for this or that fact, but are manifestly inconsistent with other facts as well established.

Thus Schiaparelli, noting that some comets have orbits passing near the orbits of one or other of the giant planets, suggests that the giant planets have from time to time captured comets or meteor systems which, before that last unfortunate visit of theirs to our solar system when Jupiter or Saturn or Uranus or Neptune captured them, had been wandering about unattached to any system through interstellar space. The theory leaves far the larger number of comets and meteor systems unaccounted for, it gives no real account even of the origin of those which exhibit the peculiarity it strives to explain, and, as a matter of fact, the giant planets have been proved to be quite incapable of playing the part assigned to them. But for these defects the theory would perhaps be acceptable enough.

Again, Prof. Newton, of Yale, noting that meteor streams travel in the tracks of comets, advances the theory that meteors have been, as it were, chipped off from comets. But as meteors present peculiarities of structure by no means explained by this theory, as a comet must exist before meteors can be chipped from it, and as the chipping process is mechanically impossible, this theory also is open to some slight objections.

Then again, Tschermak, noting the resemblance of structure between meteorites and volcanic products suggests that meteors of all orders (which would include meteor streams, and therefore comets) were shot out from the earth in days when she was young. But though this is better than the other theories, in at least suggesting some sort of an origin for comets and meteors, it will not account for comets which never come within many millions of miles of the earth's orbit, and a theory which fails for some among the comets cannot be the true general theory for meteors either.

Mr. Sorby, of Sheffield, the eminent mineralogist, deduced from the microscopic structure of certain meteorites the startling theory that they had once been inside the sun; for there is evidence that their substance once existed in the form of globules of molten metal, which aggregated into large masses, which in turn were exposed to violent friction, indicating conflicting motions at very high velocities. "Where else," wrote Sorby, in 1864, "could such conditions exist, except first in the interior, and afterwards in the immediate neighbourhood of our sun?" But it is absolutely certain that the theory as thus suggested cannot possibly be true, either as a general explanation of meteors and comets, or even as an explanation of any known meteor system or comet, unless, perhaps, a few of the comets whose orbits pass very near the sun were sunborn, and subsequently disturbed by planetary attractions so as not to return to their parent orb. A flight of meteors, shot out from the sun, as Sorby suggested, might have velocity enough to get away from him for ever, in which case we should never see a trace of it again, not though we waited for millions of years. If, however, it could not get away, then it must return to its starting-place—that is, back to the sun's globe—unless, passing near enough to one of the giant planets, it were so far disturbed as only to return grazing by past the sun's surface. (The comets of 1843, 1880, and 1882, which all had the same orbits near the sun, almost grazing his surface, may well have been parts of a single meteor-flight shot out from his interior millions of years ago.)* As a general theory, this fails like the others.

Better, though still failing as a general theory, is that suggested by Graham, of London, to account for the large quantities of hydrogen "occluded" within the substance of certain iron meteors, and by Daubrée, the French physicist, to account for the volcanic structure of meteorites. According to their theory, meteors, and therefore comets, were shot forth from the interior of stars. As Graham put it, "the iron meteors have brought to us, across the interstellar depths, the hydrogen of the fixed stars." And Daubrée, by arranging meteorites into their several orders, and showing how volcanic products may be similarly arranged in a series including all the forms found in meteorites, extended the theory of stellar origin to include all orders of meteors. Yet are there fatal objections against this, at any rate, as a general theory. It leaves unexplained the peculiarity which Schiaparelli had tried to interpret—the strange tendency among certain comets to hang about the orbits of the giant planets. Moreover, now that the meteor streams crossing our earth's track are numbered by hundreds, a theory which explained all meteors as sprung from the stars would indicate an inconceivably immense number of meteor streams within our solar system to account for our earth's track crossing so many.

To get at the true general theory of comets and meteors we must combine what is sound in all these theories, since the true theory must accord with all the known facts. This is what the theory I have maintained during the past few years actually does, and that is why, so far from admitting that it is a daring theory, I regard the others as overbold (running "à travers" known facts, as they all do) and mine as cautious and modest, startling though its fundamental idea may seem.

All comets and meteors, according to my theory, are sunborn. But it is not to our own sun, with Sorby, nor to those other suns, the stars, with Graham and Daubrée, that I attribute all comets and meteor systems. Many millions have come doubtless from our sun during the many millions of years he has been a sun, though few of his cometic children are known to terrestrial astronomers. Millions of

* Reprinted from the *New York World*.

* Since this appeared it has been announced that the new comet discovered in the Southern skies is also following in the same track—confirming my theory that the comets of 1668, 1843, 1880, and 1882, were parts of one large comet, dissipated, doubtless, millions of years ago.

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millions have come from the many millions of suns in our galaxy during the many millions of years of their sunlike existence. But the giant planets were once suns, and in their sunlike state, which must have lasted millions of years, they must have ejected their smaller comets and meteor systems, which even now after millions of years have paths passing near the orbits of their parent orbs. Our earth and her fellow terrestrial planets had their sunlike stage of life, too, and it must have been while the earth was a sun that the meteors explained specially by Tschermak's theory were expelled.

All the known facts correspond with the general theory thus presented; nor can any fact be noted which even introduces a difficulty, though of course it is very easy, as some astronomers in America have recently shown, to point out that comets and meteors whose interpretation belongs to one part of my theory cannot be well explained if we try to interpret them by another part.

Lastly, the only sunlike body we can study, our own sun, has been caught in the very work of ejection which this theory assigns to sunlike bodies.

## THE ORIGIN OF MOUNTAINS.*

THE "delightful uncertainty of science" forms one of its chief charms to the candid mind, as the absolute fixity of dogma forms its main recommendation to stupidly conservative and unprogressive intellects. Dull people like to be told a thing once for all, and to stick to it thenceforth and for ever with a Chinese invariability, an immovable stolidity as of the Medes and Persians. Intelligent people modify their opinions in accordance with new facts or new aspects of events as soon as these are brought to their notice. Geology (on its dynamic side at least) is still to a great extent in that plastic stage where great modifications may yet be expected, and where a corresponding modifiability of opinion is therefore most necessary to every student. Mr. Mellard Reade's book on the origin of mountains is a splendid example of the sort of shaking our preconceived ideas may any day suffer. We do not say he has entirely upset all our current notions about the growth of mountain ranges; we must wait to assert that till his theory has been thoroughly sifted and debated and fought over, as it will be, by all the competent specialists in his chosen science. But we do say he has administered a rousing dose of vigorous scepticism, and submitted the accepted theory on the subject to a powerful solvent, which leaves us at least in an attitude of suspended judgment, with a distinct inclination towards Mr. Reade's own way of thinking.

The theory of the origin of mountain chains at present in vogue—the theory more or less supported, hypothetically at least, by the great names of Lyell and Geikie—refers them in the last resort to tangential strains, regarding them essentially as ridges due to the compression induced in the rigid outer crust of the globe by a shrinkage of the heated nucleus within. This theory Mr. Reade subjects to a very thorough and crushing criticism. He insists upon applying to it strict arithmetical and mathematical tests, and shows, we venture to believe, most surprising flaws in the reasoning by which it has hitherto been sustained. Briefly put, the result of his investigation, on the destructive side, is to prove that no shrinkage sufficient for the purpose exists, and that the greatest conceivable shrinkage would be quite inadequate for the production of the effects ordinarily attributed to it. The reasoning in this controversial portion of his work, however, is so close and condensed that it hardly admits of presentation in a brief summary. Readers must turn for information to the work itself. On the constructive side, Mr. Reade opposes to the orthodox theory a new and most plausible hypothesis of his own. He begins by showing that periods of great sedimentary deposit precede the birth of every large mountain chain. Now Babbage proved long ago that an addition of sediment to any part of the earth's crust must raise the temperature of the subjacent mass which it covers and encumbers. The "isogeotherm" or line of equal temperature will therefore rise, and by a series of reactions, which Mr. Reade describes in full detail, will produce immediate results by expanding the new sedimentaries in every possible direction. But the tendency to expand horizontally is checked, of course, by the rigid mass of the earth's crust bounding the locally heated area. The heated area is, therefore, forced to expand vertically alone, and to form those ridging-ups of the surface which we know as mountain ranges. Mr. Reade, being himself a civil engineer of considerable experience, has experimentally determined the mechanical effects of expansion by heat on bars of various sandstones, marbles, and other like materials, and has proved that stone does actually ridge up under such circumstances so as to produce miniature mountain ranges. Being also an accomplished geologist, he has applied his theory to the explanation of large classes of facts in dynamical geology; he accounts for the foldings of strata, the repacking of beds, and the production of faults, in a way which is certainly ingenious and appears to possess much plausibility as well. The thing hangs together with notable verisimilitude. His whole theory, indeed, proceeds upon the now familiar line of pointing out the vast cumulative effects of comparatively small and unobtrusive factors. As an example of the quantitative effect of a rise of temperature in a given area and depth of rock he takes a district of five hundred miles in length by five hundred in breadth. The crust to a depth of twenty miles beneath this comparatively small district would comprise five million cubic miles of rocky material. If this mass were heated to a mean of 1,000° Fahr.—a temperature which, says Mr. Reade, must have occurred over and over again in the local heating of the earth's crust—there would be an increase of volume to the extent of 52,135 cubic miles, which excess must necessarily rise in the arched or vaulted form of a mountain chain. Enormous as this result may appear at first sight, the block of crust here postulated is nevertheless only the $\frac{1}{31875}$ part of the solid matter of the whole globe. The mountain chain thus produced would be indeed but a very insignificant one; the vast masses of sedimentary deposit out of which have been formed and carved the Alps, the Andes, the Rocky Mountains, and the Himalayas are spread out over enormously larger and wider areas. The greatest of mountain ranges indeed are but trifling excrescences upon the outer surface of our third-rate planet.

It would be premature to pronounce dogmatically upon the truth or error of Mr. Reade's startling hypotheses. They must be tested by time, and verified or disproved by the long and careful observations of working geologists. But whether true or not, there can be no doubt at all of their fundamental importance, their singular originality, their admirable elaboration, and the skill and ability with which they have been worked out and presented to our minds. His doctrine, in fact, is simply revolutionary. If he succeeds in convincing others, he will have altered our entire conception of dynamical geology. If he does not succeed, he will at least have aroused a wholesome scepticism

* "The Origin of Mountain Ranges." By T. Mellard Reade, C.E. (London: Taylor & Francis. 1886.)

and a ferment of inquiry which cannot fail to elicit fresh truths upon this difficult line of investigation. It is long since geological literature has been enriched by so able, so philosophical, and so profound a work.

## Gossip.

By Richard A. Proctor.

A clerical reader asks me to insert these notes on my article on "The Beginning of Christianity." "They do not deal," he remarks, "with debateable matters or interpretations, but with simple facts":—

1. The Gospel of St. John does not contain a word bearing on the Quartodeciman dispute, though, strange to say, it is a not uncommon notion that it does.

2. In the wholesale rejection of all but five of the books of the New Testament you are not dealing with "ascertained facts," but accepting unreservedly the aggregate of theories supported by various critics, who display among themselves huge differences of opinion.

As to the second note, I remark that, in the article referred to, I have not accepted unreservedly or otherwise the opinion of Baur. I expressly spoke of those five books of the New Testament as proved to have been really written by those whose names are associated with them, which by no means implies any opinion as to the remaining portions of the New Testament. But elsewhere I have undoubtedly conveyed as mine the opinion that the three first Gospels cannot possibly have been written by those whose names they bear. It requires no study of Strauss or Baur, or other kindred critics, to find the clearest traces in the Gospels named after Luke and Mark that they belong to the beginning of the second century. The Gospel according to Matthew may have been in existence nearly in its present form as early as 80 A.D., while those passages in which reference is made to the second coming of Christ must have been written (and possibly by Matthew) shortly before the fall of Jerusalem—say somewhere between 60 A.D. and 70 A.D. By the time the second Gospel (by which I mean Luke's not Mark's) was written, it had become clear that the expectation of the approaching end of the world which, whether he had held it himself or not, Christ had certainly aroused in the minds of his followers (assuming as much of the narrative as we possibly can to be historical) had been delusive. The Gospel according to Mark is so manifestly compiled from the other two that its date must be set later than theirs. The only reason for setting it before the Gospel according to Luke would seem to have been some idea of explaining the opening words of the last-named narrative—though still leaving those words open to an exception akin to that suggested by Biondello, since Matthew and Mark, though they may be more than one, are yet not many.

* * *

My clerical critic's first note touches as little on what I actually wrote as his second. I certainly never suggested that the writer, or (if Arnold is right) the compilers, of the fourth Gospel wrote one word bearing on the Quartodeciman controversy. In the progress of that controversy, as every student of the history of early Christianity knows, many subjects were dealt with besides the altogether paltry Quartodeciman question itself. I write away from my books, being in the midst of the petroleum region of Pennsylvania on a lecturing tour, and am therefore unable to give details with all the accuracy I should desire. But I think I am right in saying that Polycarp, somewhere about the years 165, 166 (he was killed in 167), took part in the Gnostic controversy against Valentinus and Marcion. Irenæus, unless I mistake, mentions that Polycarp quoted against the Gnostics the words of John the Apostle. And it is certain that Justin, somewhat earlier (he was killed in 164), did *not* quote John in favour of Gnosticism. Yet the Gospel according to John is not only obviously not by John, and not in the slightest degree "according to" the intensely anti-Pauline John of the Apocalypse, but is ably and powerfully Gnostic. Throughout the period during which the Quartodeciman controversy was in progress, the authority of the fourth Gospel in favour of Gnosticism would have been repeatedly quoted had the Gospel then been recognised as canonical—nay, had it even existed. The "Fragment of Muratori" showed that it existed very soon after, and the Gnostics took care that it should quickly be recognised as of authority. But the fact that Polycarp had quoted John the Apostle against the Gnostics can never be reconciled with the alleged authorship of the fourth Gospel—apart from the obvious difference between the ideas of its writer and those of the writer of the Apocalypse.

* * *

Of course the evidence is also clear that the fourth Gospel could not have been written by a Jew. To mention but one striking proof of the foreign authorship, the three oldest original manuscripts have "Bethany beyond Jordan" where the later writers ingeniously substituted "Bethabara." Now, as Matthew Arnold points out (I think in his "God and the Bible"), a Jew would be about as likely to speak of "Bethany beyond Jordan" as an Englishman to speak of "Willesden beyond Trent," Bethany being a suburb of Jerusalem, and Jerusalem not within twenty miles of the Jordan.

* * *

The actual Quartodeciman controversy related, of course, to the absurdly trivial question whether Easter Day should be wholly determined by the Jewish Passover, or so far regulated by Christian rules as to fall always on Sunday. On this matter the Eastern and Western Churches took opposite sides, and adhered to their opposite opinions with a resolution worthy of a better cause. The fourth Gospel only indirectly suggests any opinion on the question. The writer, whoever he may have been, always speaks of Jewish ceremonials like a Gentile, not like a Jew; and we may infer that his opinion on the great Fourteenth Day controversy would have been in favour of the decision adopted by the Eastern Church, according to which the strictly Jewish usage was abandoned in favour of a half-Jewish, half-Christian compromise.

* * *

The following letter has been addressed to the publishers of Knowledge by another clerical correspondent:—

In the last number of Knowledge there is an article on the "Beginning of Christianity," by Mr. R. A. Proctor, in which the following passage occurs:—

"Even so strange a circumstance as the crucifying of three persons, of whom two died but the third was restored to life, actually happened to the knowledge of Josephus, who describes the event in the most natural manner; but it happened long after the time of Pontius Pilate, and the three who were crucified were Josephus's personal friends."

Would you have the goodness to ask Mr. Proctor his authority for saying this?

On the event referred to Josephus writes thus:—

"Now there was about this time Jesus, a wise man, if it be lawful to call him a wise man, for he was a doer of wonderful works, a teacher of such men as receive the truth with pleasure. He drew over to him both many of the Jews and many of the Gentiles. He was [the] Christ. And when Pilate, at the suggestion of the principal men among us, had condemned him to the cross, those that loved him at the first did not forsake him: for he

appeared to them alive again the third day, as the divine prophets had foretold these and ten thousand other wonderful things concerning him. And the tribe of Christians, so named from him, are not extinct at this day." (Book xviii. chap. iii. of the small edition of Whiston's translation of Josephus.)

* * *

The passage here quoted is the now notorious interpolation, too clumsily managed to deceive any, since it contradicts the whole tenor of Josephus's writings in regard to the promised Messiah, and, indeed, makes Josephus's whole life self-contradictory. Even Canon Farrar, whose receptivity in such matters is remarkable, says of the passage, it is "interpolated if not wholly spurious"; and again, "Josephus did not choose to make any allusion to facts which were even remotely connected with the life of Christ." (See Farrar's "Life of Christ," chap. vi. 3.)

* * *

The passage to which I referred runs thus:—

"As I came back" (from Teckoah) "I saw many captives crucified, and remembered three of them as my former acquaintance. I was very sorry at this in my mind, and went with tears in my eyes to Titus and told him of them; so he immediately commanded them to be taken down, and to have the greatest care taken of them, in order to their recovery; yet two of them died under the physician's hands, while the third recovered."

* * *

My "authority" for this is Josephus (see edition above mentioned, "Life of Josephus," section 75). It should be remembered that this account of the resuscitation of one of three crucified persons, under the care of Joseph the Asamonean, was published at least a quarter of a century before the account in the Gospel "*according to* Matthew," of how Joseph the Arimathean went to Pilate and begged for the body of Jesus, that one of three crucified persons whose restoration to life that Gospel records.

* * *

Not ten years have passed since Brigham Young died. Hundreds saw him dead, and all the circumstances of his last illness and death are known. It will hardly be believed that in these matter-of-fact days the believers in Young, as chief of the Latter Day Saints, assert that he is now alive again.

* * *

Since Mr. Boss started, and Professor Piazzi Smyth adopted, the mistake into which several others (I being one) rather naturally fell, of regarding the comet of 1882 as the same body as the comets of 1880, 1843, and 1668, I have maintained the probability that all these comets were originally one, which was dissipated into several components long ago, and that more fragments may still arrive. It seems as though the large comet recently discovered confirms the justice of this suggestion, for it is travelling in the same track near the sun as was followed by the comets of 1668, 1843, 1880, and 1882.

* * *

I recently had occasion to note, in connection with this same comet of 1882, a curious illustration of the unfair way in which men are apt to be treated who announce and correct their own mistakes as freely as they would those they had detected in the work of others. It was, as is well known, Mr. Boss in America who, immediately after the discovery of the comet of 1882, started the idea that it was the comet of 1880 and 1843 come back again. Professor Piazzi Smyth eagerly seized the notion, because it confirmed, as he thought, his belief that the end of the world was to be brought about at this time, the second coming of Christ (which Christ himself, according to the Gospels, regarded as "the end of the world"), being definitely announced by the grand gallery of the Pyramid of Cheops, for July 1882. But others fell also into the error, at that time a very natural one, of supposing that the practical identity of the perihelion parts of those comets' orbits implied the identity also of the comets. I was one of these; Mr. Hind, of the *Nautical Almanac*, was another. I was the first to point out that we had been deceived. The coincidence in question could not be accidental; *but* also it could not be explained as we had endeavoured to explain it.

* * *

But because I, being neither the first nor the second to fall into a certain very natural mistake, was the first to indicate its nature (and have been alone, to the best of my knowledge, in carefully announcing and correcting it), it appears that many have fallen into the by no means natural error of supposing that to me belongs the chief discredit, such as it may be, for making the original mistake. Recently, an ardent admirer of Professor Smyth's pyramidal theories, having occasion to fall foul of me because I regard the stone bible theory of the pyramid as erroneous (to begin with, and a trifle blasphemous, to go on with), took occasion in a magazine of his, called *Ford's Christian Repository*, to proclaim lustily that my opinion need not be regarded as of any weight, since I had made this particular error, whereof he spoke as of a blunder by which I had notoriously incurred discredit. Of course, this gave one some interesting amusement in opening the Rev. Mr. Ford's highly Christian optics, by first showing how unimportant the mistake really was, and then mentioning casually that, such as it was, his *protégé*, Professor Smyth, had had much more to do with its adoption than I had. But I venture to insist that while making mistakes proves (according to the true saying of Liebig) that a man's mind is fecund—the man who makes no mistakes being necessarily a dullard—acknowledging a mistake frankly, fully, and early, should engender confidence not doubt in the man who has thus erred and admitted it.

* * *

"Show me a man who has made no mistakes," said Liebig, "and I will show you a man who has discovered nothing." Show me a man, I would add, who has never acknowledged a mistake, and I will show you one who, unless he be one of Liebig's dullards, is dishonest and untruthful. He has done more harm to science by bad example than could be repaid by any number of brilliant discoveries.

* * *

It is strange how weak some men are about this matter of recognising and admitting error. Unfortunately the weaklings in this respect judge others by themselves. I have a friend (supposing I have not lost him of late) who up to some ten years since scarcely let a month pass without some noteworthy discovery, and whose work therefore I never tired of dwelling upon with enthusiasm. But during the last ten years or so he has announced no discoveries of any interest (if any at all), and naturally I have been silent. A year ago I went so far as to suggest, with complimentary reference to his past achievements, a hope that we should soon hear of others as noteworthy—especially as he has been placed in charge of a much more powerful telescope than he formerly had. Ever since, he has laboured under the truly amazing idea that I no longer praise his work because he has not yet accepted my theory of comets and meteors! Among those who read these lines there must I think be many thousands who within the last year have

read and heard many enthusiastic words of mine in regard to this erst earnest observer's work in the past. Let him give me any new work to "enthuse" over, and he will quickly see whether I am colder than of yore.

* * *

Rather amusingly, I read within a few hours of sending off my remarks on "Prize Competitions" a cablegram in the *New York World* mentioning two lists of "Forty" drawn up by readers of the *Pall Mall Gazette*, in one of which my own name is included. I do not learn from the paragraph whether anything in the circumstances may make these lists of Forty entirely imaginary Academicians differ from those on which I have commented. But, in any case, I must fully and unaffectedly disclaim all pretensions to anything even tending towards the "celebrity" supposed to be suggested by such lists as these. Except my treatise on "Saturn," which has reached few, my still more fascinating "Geometry of the Cycloids," which has reached fewer, and one or two atlases which are, I hope, useful, everything I have yet published has merely indicated the course those studies of mine have taken, which I hope to embody in a treatise on astronomy now nearly a quarter of a century in preparation. Either my name illustrates very effectively the argument in my paper on "Prize Competitions," or it has been added to these lists by way of a joke—unless some few have seen, very far ahead, the real purport of my inquiries in astronomical matters.

* * *

A correspondent informs us that Mr. Henry L. Ward, a rising young naturalist of Rochester, N.Y., has recently secured several specimens of the West-Indian seal (*Monachus tropica*) which had long been thought extinct.

* * *

From *Punch* the facetious (?)—

> Lilly writes brightly
> In the *Fortnightly*,
> Meaning sharp Huxley to settle;
> Huxley looks silly,
> Finding his Lilly
> Turns out a stinging-nettle.

Mr. Lilly is a Roman Catholic, so is Mr. Burnand, editor of *Punch*, author of "Happy Thoughts" and other philosophical works; hence Mr. Burnand's fitness to judge and impartiality of judgment.

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Bacon and Modern Science.—Whatever debt the world of science may owe to Bacon, it was not the invention of the method of research by which all great discoveries in science from long before Bacon's time till now have been effected. Yet, if we are asked in what way Bacon helped the progress of science, and in what degree, our answer must speak very strongly in his favour, though we must reject the false notions commonly entertained. Unquestionably Bacon's two great works, the "Instauratio Magna" and the "Novum Organum," gave an immense impulse to the development of science *in England—not* by their influence on scientific workers and thinkers, not five in a hundred of whom have ever studied those works, but by the general attention which they directed to the prevalent faults of the methods in vogue when they were written. A false syllogistic system, applied to imperfect or insufficient evidence, offended justly the clear mind of Bacon: he attacked and overthrew that method, and though he was no student of science himself, in any true sense of the word, though his ideas about matters scientific were mostly erroneous and his knowledge of the science of his day most imperfect, yet by his advocacy of the true general principle that Nature will reveal her secrets only in response to sedulous and reiterated inquiries he moved the mass of thinking men to adopt a truer method of research. They did not adopt the method carefully defined and described by Bacon; they did not even adopt a new method; but as a body they became disciples of the true school which, when Bacon wrote, had been exiguous in the extreme.

## Reviews.

*The Cruise of the Marchesa to Kamschatka and New Guinea.* By F. H. H. Guillemard, M.A., M.D. (John Murray.)—These sumptuous volumes are a worthy addition to the standard works of travel issued from the historic house in Albemarle Street. Dr. Guillemard writes in a clear and animated style; the scenery which he describes is brought vividly before us in superbly executed woodcuts from his photographs, and the route is easily followed by the aid of many excellent maps. The cruise of the *Marchesa*, an auxiliary screw schooner of 400 tons, extended from January 1882 to April 1884, during which period regions, already known to us through the graphic narratives of Mr. Alfred Wallace and other explorers, were visited, and concerning which Dr. Guillemard therefore exercises wise brevity, while other regions, less familiar, give ample employment to his pen. The voyage, in its scientific results, was successful, 3,000 specimens of birds and a large collection of insects being secured, the birds from Sulu including a hitherto unknown species of bush-shrike, which is the subject of one of the two richly-coloured frontispieces. Another find was in New Guinea, where Dr. Guillemard, whose chief object there was to procure birds of paradise, had the good fortune to capture an echidna, or spiny ant-eater, over two feet long, and therefore larger than its Australian representative. Touching at Formosa, the precipices of which are more imposing than even the cliffs of the Yosemite valley, and the former connection of which with North India and Sumatra is proved by the similarity of its fauna, the *Marchesa* paid a flying visit to Japan on her voyage to Kamschatka. The chapters on the history, physical character, and fauna of this peninsula, with its thick forests, its belt of eruptive volcanoes, the highest of which is nearly 16,000 feet, its far-extending *tundras*, its hybrid population so thinly scattered that the doctors in their long rounds leave the sick physic enough for a year, and its salmon-snaring rivers, are full of fresh and entertaining matter, the more welcome, as there is little of adventure wherewith to enliven the volumes. The visit to New Guinea was confined to its Dutch or western half, and such fragmentary notes as are given concerning the mop-headed Papuans and their customs and beliefs are useful additions to our scanty knowledge of an island which has yet to be fully explored. The houses built on the piles by the waterside, the holes in their flooring for the refuse to be thrown away, and the curious crescent head-rests, which latter occur in Egypt and elsewhere, give reality to the ancient life of the lake-dwellers described by Herodotus, and reconstructed in Dr. Keller's researches. But enough has been said to commend Dr. Guillemard's volumes to our readers.

*An Arctic Province: Alaska and the Seal Islands.* By H. W. Elliott. (Sampson Low & Co.)—Kamschatka is the land of the sable and the salmon; Alaska of the fur seal. Twenty years ago the United States of America gave Russia seven million dollars for the territory of Alaska, a land of bewildering indentations, endless coast-line fringed with thousands of islands and islets, beaten by wind and waves, scarred by volcanic eruptions, enveloped in persistent fog, and cursed by mosquitoes—a region so gloomy that "the good Bishop Veniaminov, when he first came among the natives of the Aleutian Islands, ordered the curriculum of hell to be omitted from the church breviary, saying, as he did so, that those people had enough of it here on earth." Mr. Elliott's volume is encyclopædic in its details of the features of this desolate, pitiless land, and of life among the Indians whose rancheries, each with its

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oddly-carved post displaying the totem of the owner, are grouped into more or less permanent settlements near the great fishing-grounds, every village being governed by its unwritten code, disobedience to which lays the offender open to reprisals by the offended. Though the forests teem with animal life, goats, deer, and grouse, the natural indolence of the native limits him to the easier work of fishing, except where the high prices offered by the white traders for the prized skins of the rapidly-diminishing sea-otter tempt the hunters to its exciting and hazardous pursuit. The most interesting and valuable chapters are those which describe the fur-bearing animals of the Pribylov Islands, a volcanic group in Bering Sea. The most highly organised of these creatures is the fur-seal, "indeed, when land and water are weighed in the account together, there is no other animal known to man which may be truly classed as its superior from a purely physical point of view." Mr. Elliott writes with the authority of an expert, and the account which he gives of the several species of pinnipeds found in the seas round Alaska is very complete, while his chapter on the struggle between the males for possession of the breeding-grounds, or "rookeries," as they are called, supplies important evidence in favour of Darwin's theory of sexual selection. We regret that space prevents quotation from his graphic account of the terrible combats between the bulls for the few feet of rock on which they await the coming of the cow-seals, the average number of which in the harems is from twelve to fifteen. Altogether, this is an honest and veracious book, though somewhat laboured in style, and with illustrations of unequal merit. It should be read in conjunction with Dr. Guillemard's volumes as dealing with countries in close contiguity.

*The Factors of Organic Evolution.* By Herbert Spencer. (Williams & Norgate.)—This is a reprint, with additions, from the *Nineteenth Century* of April and May last. It is intended to be supplemental to Mr. Darwin's theory, and we may call special attention to the sections treating of the general and constant operation of surrounding agencies on the organism, and of the direct action of the medium as the primordial factor of organic evolution. The following extract gives the gist of Mr. Spencer's argument :—

> In the primordial units of protoplasm, the step with which evolution commenced must have been the passage from a state of complete likeness throughout the mass to a state in which there existed some unlikeness. Further, the cause of this step in one of these portions of organic matter, as in any portion of inorganic matter, must have been the different exposure of its parts to incident forces. What incident forces? Those of its medium or environment. Which were the parts thus differently exposed? Necessarily the outside and inside.

*Sonnets on Nature and Science.* By S. Jefferson. (Fisher Unwin.)—Among the many themes which inspire the author's limping muse are the Amœba, Seismic force, the Equinoctial gales, the Nebular Hypothesis, and the Luminiferous Ether. Concerning this last the poet sings :—

> No chemist knows of what this gas consists,
> The physicist its minute waves may count,
> And trace their course across the deep profound,
> For science can but say that it exists,
> That, almost infinite in its amount,
> It fills the wide extent of Cosmos round.

Slightly altering a quotation from Lord Byron, we may safely predict that Mr. Jefferson's sonnets will be read when Wordsworth and Shelley are forgotten—but not till then.

*Evolution and Creation.* By H. J. Hardwicke, M.D. (Purton Lodge, Sheffield; published by the Author.)—Dr. Hardwicke is for the most part his own printer and artist, and the result is more or less a hotch-potch. The unattractive look of this volume should not, however, affect our judgment of its contents, the essays on "Man's Antiquity" and the "Evolution of Mind" being well and clearly written. In his remarks on the "Evolution of the God Idea" Dr. Hardwicke is a less trustworthy guide, his philology, *e.g.* the discussion on the word *God*, being unsound, and his leading authorities more or less discredited.

*Essentials of Histology.* By E. A. Schäfer, F.R.S. (Longmans.)—Histology is the science which treats of the minute structure of tissues and organs, and Prof. Schäfer's work is written with the double object of serving as an elementary text-book of histology and of supplying the student with directions for microscopical examination of tissues. The work, in our judgment, is complete both in its exposition of the subject and in its instructions to students, while the illustrations, both borrowed and original, are admirable.

*Society in the Elizabethan Age.* By Hubert Hall. (Swan Sonnenschein & Co.)—Mr. Hall has made industrious use of his official connection with the Public Record Office to collect material from its stores for social sketches of England three hundred years ago. But, in place of a broad sketch of the town and country life of that period, such as the title of his book leads us to expect, Mr. Hall gives a series of representative portraits, comprising the landlord and tenant, the courtier and bishop, the civil servant, lawyer, and burgess of the time. On the whole, this method of isolation is disappointing, causing the work to lack both cohesion and perspective. With such materials to work upon, Mr. Hall could not fail to bring together many curious and interesting items, from which the pens of more ready writers may elaborate a worthy picture of the England of Elizabeth. The volume is prefaced by an admirable map of London from Cheapside to "St. Jemes Park."

*The Folk Songs of Italy.* By Miss R. H. Busk. (Swan Sonnenschein & Co.)—The accomplished authoress of "The Folk Lore of Rome"—of which scarce book a reprint would be welcome—now brings from her treasury, in which the collections of twenty years are garnered, specimens of folk songs from all parts of Italy, the place of honour being given to the songs of Sicily. Like the *Volkslieder* in Germany, they fill the Italian air, although Miss Busk utters the old lament that the songsters of every degree, from the prima donna to the peasant, are daily becoming rarer. "The old folk rhymes, which are nearly always the utterance of pure and holy affection, are now only met in country nooks; the townspeople, if they sing at all, are provided with another class of songs which we should not care to read." The more important and praiseworthy, therefore, is the task which Miss Busk has valorously undertaken—a task the difficulty of which, in the face of the seven hundred dialects in which the songs exist, is enormous. The principles which have governed her in selecting and translating are set forth in the Preface, which explains the leading features of the several classes of songs, and is enriched with a pathetic sketch of Beatrice Bugelli, one of the latest peasant poets. Miss Busk has earned the gratitude of all lovers of lyrical verse and folk-lorists for this delightful and daintily-printed little volume.

*Tales of the Caliph.* By Al Arawiyah. (Fisher Unwin.)—A series of ingenious tales relating adventures supposed to have happened to the Caliph Haroun Al Raschid, or to persons whom he met in his usual night rambles *incognito*. No claim of derivation from original Oriental sources is made on behalf of these tales, hence the absence of strict fidelity to local colouring. The last story is amusing, although the idea is not novel. The unlucky

possessor of a magic tube, peeps into which reveal the future, describes a vision of telegraphs and railways to the Caliph, who, enraged at his monstrous inventions, orders him to immediate execution.

*She.* By H. Rider Haggard. (Longmans.)—"She" already numbers its readers by thousands; it has provoked a parody in which the deft hand that wrote "Much Darker Days" is traceable, and, moreover, an explanation from Mr. Rider Haggard of the esoteric teaching of the wonderful story. We confess that we do not greatly care to know that the lessons intended to be conveyed in the career of Ayesha are the deathlessness of deep love and "the probable effects of immortality working upon the known and ascertained substance of the mortal," Ayesha's insolent menace against Omnipotence, as her hardness and cynicism grow with the creeping centuries, being punished by the terrible fate described in the story. The fertility of invention characterising "She" delights and enthralls us, and, moral or no moral therein, we read it with interest that deepens as the tale advances to the awful sequel. But Job, who is intended as a comic set-off against the graver characters, is an irritant, and the story would gain by his removal.

*Books and Bookmen.* By Andrew Lang. (Longmans.)—Books about books have a perennial charm, and bibliophiles may without hesitation accord Mr. Lang's new volume brevet rank as a worthy comrade with his former book on "The Library," and with Dr. Hill Burton's classic "Book-Hunter." The book collector is on a lower plane than the lover of literature, to whom the form is nothing, the spirit everything. But although the accident and not the essence, the clothing and not the soul, make the book dear to the collector, his functions are more useful than his intentions, since his care for the lesser secures the preservation of the greater. Mr. Lang, we need scarcely say, does not value books for their externals alone, and in the limits which he has set himself gossips in chatty, learned fashion, the learning being dropped in in his happy allusive way, about the true and spurious in the famed Elzevirs; about the art of the old binders, notably the French; about title-pages, quaint specimens of which are given in facsimile: and then wanders off to gossip on parish registers and literary forgeries. To the volume is added a reprint on "Japanese Bogie Books," from the *Magazine of Art*, with gruesome illustrations of a storm-fiend and a well-and-water bogie, limp and washed out, with drooping and dripping arms, perchance a washer of dead men's linen in the moonlit pools and rivers. Mr. Lang tells us he has spared our nerves in not venturing to copy yet more awful specimens of Oriental spectres.

*The Arithmetic of Electrical Measurements.* By W. R. P. Hobbs. (London: Thos. Murby.)—This little book will be found handy by everyone engaged in the economic application of electricity. It contains a large number of numerical examples of the strength of current, and of resistance produced by arrangements described in the text. In the outset an illustrative example or two are worked out at length, and then a series of questions are set for exercise.

*An Elementary Text-book of British Fungi.* By Wm. Delisle Hay, F.R.G.S. (London: Swan Sonnenschein, Lowrey, & Co. 1887.)—Here is another botanical work, addressing even a larger public than that of Professor Strasburger. For the chief end proposed to himself by Mr. Hay is the description of fungi in their economic aspect—a subject of great and growing interest to all who wish to find some cheap nitrogenous substitute for the butcher's meat which has become so needlessly costly; to say nothing of the *gourmet*, to whom many an unknown and unsuspected form of "toadstool" will come as a delicious esculent. Among the most valuable chapters in the book may be mentioned the one on the discrimination of edible fungi; that on the chemistry and toxicology of fungi; while in the Appendix no less than 133 recipes for cooking mushrooms and other fungi are given. The very numerous engravings are beautifully executed. If the circulation of this volume is commensurate with its popular interest, it should surely be very considerable.

*Celestial Motions: A Handy Book of Astronomy.* By Wm. Thynne Lynn, B.A., F.R.A.S. Fifth edition. (London: E. Stanford. 1887.)—We need only note here that in this fifth edition of Mr. Lynn's excellent little book (of which we have on previous occasions spoken in terms of praise) the information is brought down to the very latest date, and that a chapter has been added on the refraction, propagation, and aberration of light.

*God and His Book.* By Saladin. (London: W. Stewart & Co.)—By unseemly flippancy, and irrelevant levity, "Saladin" seriously weakens a case which is, to a considerable extent, irrefutable. Many of his readers who will be unable to find any valid reply to his objections, will be repelled by the tone in which they are advanced, and he will thus excite hostility in some whom a different style of argument might have converted into allies. Notably will he raise antagonism in cultured students of his book, to whom his "chaff" (we can find no more appropriate word than this slang one for it) will be revolting. There can be no doubt that the calm, pitiless, unimpassioned marshalling of facts in "Supernatural Religion" has done more to shake the foundations of the faith (or credulity) of thousands who, prior to its perusal, were models of orthodoxy, than all the irreverent jests of "Colonel" Ingersoll and his school put together. We are the more disposed to regret the general style of the volume before us when we find—as in one or two of the chapters towards the end of the book—to what a height of pathos and real eloquence its author can rise when he chooses.

*The Young Carthaginian; or, A Struggle for Empire.* By G. A. Henty. (London: Blackie & Son. 1887.)—It is scarcely an exaggeration to say that this capital story of Mr. Henty's is the very model of what a boy's book ought to be. There is not a single dull page out of all its 384, for it is full of incident from beginning to end. We will not spoil the enjoyment of any of the thousands of lads who, we hope and believe, will soon have this volume in their hands, by anything like a *précis* of the stirring adventures of the young Carthaginian nobleman Malchus, who is the hero of the tale. Suffice it to say that he undergoes a series of most exciting ones, which, however, are strictly sequent, and arise perfectly naturally out of one another. Mr. Henty has obviously taken great pains to be archæologically correct in all his details, with the result that we seem to see his characters as living men and women before us, and to be face to face with the dead-and-gone form of civilisation of 2,000 years ago. One thing we may safely predict in connection with the volume before us, and that is that everyone who reads it will assuredly go back to his "Cornelius Nepos," or his "Livy," with a zest for information as to the lives of Hannibal, Hamilcar, and their compeers, to which, in connection with his former mere "grind," with the Latin Text and his Dictionary, he was a total stranger. We have one very trivial fault to find with the book. It is this, that the illustrations are scarcely worthy of the text. The only one that seems to us to exhibit much artistic feeling is that facing p. 210.

*Studies in Microscopical Science.* Edited by Arthur C. Cole. (Birmingham: Hammond & Co.).—There is no falling off in the interest and value of this serial, which we heartily commend to young biologists. We have also to

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acknowledge the current issues of *The Century* and *St. Nicholas* magazines, which maintain their standard of excellence; *Hazell's Magazine*, written chiefly by Messrs. Hazell's staff, the March number containing a reproduction of an excellent photograph of Mr. Ruskin; the *Medical Annual* for 1887; the first numbers of Dr. Robert Brown's *Our Earth and its Story* (Cassell's), which opens attractively and well; and of the *Classical Review* (David Nutt); *Science and Education*; and *Proceedings of American Philosophical Society*, July 1886. Of the making of school books there is no end, but the space for their acknowledgment has its limits. Messrs. Swan Sonnenschein send us a capital *Arithmetic for Children*, by A. E. A. Mair; from Messrs. Moffat we have *Letters and Themes for Composition*, and *Drawing Copies* for Standards III. and IV.; from Messrs. Relfe Brothers the *Spelling Series of Copy Books*, which should be helpful to correct spelling; *German Exercise and Copy Book* and *Combination Exercise Book for Analysis and Parsing*. *Walford's Antiquarian* (Redway) continues to improve in its sprightly treatment of subjects too long in the hands of Dr. Dryasdust. Messrs. Smith & Elder bring up the rear with a pretty and compendious reprint, uniform in style with their pocket edition of Thackeray, of *Poems by E. B. Browning*, embodying all the alterations made for the edition of 1856.

## Our Chess Column.

By "Mephisto."

### VICISSITUDES OF PAWN AND TWO OPENING.

THE following two games were recently played in the Handicap Tournament now progressing at the British Chess Club. In Game No. 1 the second player wins; in Game No. 2 the first player proves victorious. We print these games together by way of contrast. In the first game the receiver of the odds fails to obtain any advantage in the opening, and soon succumbs to a strong attack. In the second game the reverse occurs; the odds-giver is quite unable to bear up against the advantage gained in the opening by the receiver of the odds, and has speedily to yield to inevitable defeat. These apparently contradictory results may, however, be sufficiently explained by the play of the respective players. In the first game the receiver of the odds plays the opening weakly, but the odds-giver fights well; whereas in the second game the receiver of the odds plays well, but the odds-giver very indifferently; and it is this curious combination of good and bad play, in reverse order, in both games which has produced correspondingly reverse results.

Game No. 1.—Success.

Remove Black's KBP.

| White, Amateur. | Black, Mr. Zukertort. |
|---|---|
| 1. P to K4 | 1. . . . |
| 2. P to Q4 | 2. P to K3 |
| 3. B to Q3 | 3. P to B4 |
| 4. B to K3 | |

As the sequel shows, this move loses time, by allowing Black to develop. Either 4. P to QB3 or P × P are better than this.

| | |
|---|---|
| | 4. P × P |
| 5. B × P | 5. Kt to QB3 |

Black has gained a very important move.

| | |
|---|---|
| 6. B to B3 | 6. Kt to R3 ! |
| 7. Kt to Q2 | |

Kt to KB3 is better; it prevents P to K4 for the moment.

| | |
|---|---|
| | 7. P to K4 |

Whenever the odds-giver can safely play P to K4 then he has already overcome the principal difficulty in this opening.

| | |
|---|---|
| 8. Kt to K2 | |

Weak again.

| | |
|---|---|
| | 8. B to B4 |

Black is now becoming aggressive; he threatens to follow this up with Kt to KKt5, after which various possibilities of attack would present themselves either by castling or Q to R5, or P to KB4, &c.

| | |
|---|---|
| 9. P to KR3 | |

Considering the above circumstances, perhaps not an unwise precaution.

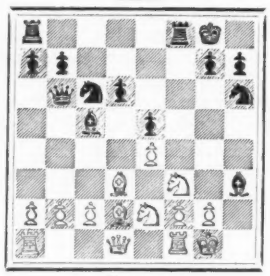
| | |
|---|---|
| | 9. Castles |
| 10. Kt to B3 | 10. P to Q3 |
| 11. B to Q2 | |

Poor Bishop! wandering aimlessly and regardless of the aggressive spirit of the times.

| | |
|---|---|
| | 11. Q to Kt3 |

Taking the best advantage of White's play.

| | |
|---|---|
| 12. Castles | 12. B × RP ! |



Black.

White.

This move proves fatal to White's future chances.

| | |
|---|---|
| 13. Kt to B3 | 13. B to KKt5 |
| 14. Kt to QR4 | |

Either Kt to Q5 or B to K2 were requisite, it would have prevented Kt to Q5 by Black.

| | |
|---|---|
| | 14. Q to B2 |
| 15. Kt × B | 15. P × Kt |
| 16. Q to B sq.? | 16. B × Kt |
| 17. P × B | 17. Kt to Q5 |

This practically decides the issue.

| | |
|---|---|
| 18. B × Kt | 18. P × B |
| 19. Q × P | 19. P to B5 ! |

And Black won in a few moves.

Game No. 2.—Failure.

Remove Black's KBP.

| White, Amateur. | Black, Mr. Gunsberg. |
|---|---|
| 1. P to K4 | |
| 2. P to Q4 | 2. P to Q3 |

It is very difficult to follow this move up properly, and any deviation from the well-known lines of play should particularly be avoided by the second player.

| | |
|---|---|
| 3. B to Q3 | 3. P to K3 |

3. B to K3 is sometimes played here.

| | |
|---|---|
| 4. P to K5 | 4. Kt to K2 |

A weak move, which enables White to develop well. P to KKt3 was now necessary.

| | |
|---|---|
| 5. B to KKt5 ! | 5. P to KKt3 |
| 6. P to KR4 | 6. QKt to B3 |

Perhaps P to Q4 would have provided Black with a loophole for his K on Q2.

| | |
|---|---|
| 7. P to R5 ! | 7. R to KKt (sq) |

Black would not play 7. P × P on account of 8. Q × P (ch), K to Q2, 9. P to Q5 ! Then again, 7. Kt × P would likewise result badly for Black.

| | |
|---|---|
| 8. P × P | 8. P × P |
| 9. P to KB4 | 9. P × P |
| 10. QP × P | 10. Q to Q5 |
| 11. Kt to QB3 | 11. B to Q2 |

Black having gained breathing time does not make the best of it, Q to Kt5 would have gained further time perhaps, and brought the Q away.

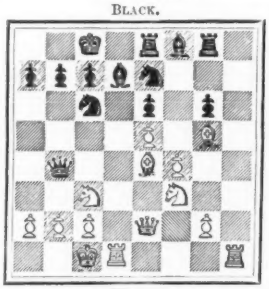
| | |
|---|---|
| 12. Q to K2 | 12. Castles |
| 13. Castles | 13. Q to Kt5 |

Black is now compelled to make this move, and lose time by doing so.

| | |
|---|---|
| 14. Kt to B3 | |

White brings all his pieces well into play, and does not hurry his attack.

| | |
|---|---|
| | 14. R to K sq |
| 15. B to K4 ! | |



Black.

White.

A good move, and the beginning of a combination well planned and executed, which speedily turns the game in White's favour.

| | |
|---|---|
| | 15. Kt to B4 |

This proves loss of time; there is nothing but Kt to Kt sq., with the hope of being able to free his game perhaps by B to B3.

| | |
|---|---|
| 16. Q to Q3 ! | 16. Kt to Kt sq. |
| 17. R to R7 ! | |

Taking forcible advantage of the position

| | |
|---|---|
| | 17. Kt to K2 |

B to Kt2 might perhaps have delayed the game longer, but the position was bad, as White then threatened 18. P to Kt4, followed by 19. P to QR3, and 20. Kt to KR4, &c.

| | |
|---|---|
| 18. Kt to R4 | |

The best? The position is a very curious one. White threatens more than merely to win a P, for after 19. Kt × P, Kt × Kt, 20. B × Kt, the Rook has no move. But there are many interesting variations possible in this position which the reader may examine, such as 19. B × P, Kt × B. 20. Kt × Kt, and the Black B on Q2 cannot move or be defended, as White would mate on Q8. Then again, Black cannot now play 18. B to B3, as White would reply with 19. B × P, and the Black knight cannot retake.

18. P to B4

For want of a satisfactory move, it avoids the mating possibilities.

| | |
|---|---|
| 19. P to R3 | 19. Q to R4 |
| 20. Kt × P | 20. KKt to B3 |
| 21. Kt × B | Resigns. |

For if Black retakes, then 22. R × B makes the game hopeless for Black.

Hindoo Cosmogony and Physics.—The Rev. Sumangala, chief-priest at Adam's Peak, in Ceylon, has recently published an account of the opinions of Hindoo astronomers on the form and attraction of the earth. Bhaskara, who flourished in the twelfth century, thought that the terrestrial globe, composed of land, air, water, space, and fire, had a spherical form, and, surrounded by the planets and the orbits of the stars, maintained itself in space by its own power. This, he says, is in fact demonstrated. Lands, mountains, gardens, and houses cover the earth as pollen covers the flower of Kadamba, and serve as the homes of men, Raksasas, Devas, and Asuras. He rejected the idea that the earth rested on anything else, for the obvious reason that, if another support were needed, there would be no end to the supplementary supports. Therefore we shall have to admit a final equilibrium somewhere; why not accept it at once? "Is not the earth one of the forms of Siva? As heat occurs naturally in the sun and fire, cold in the moon, fluidity in water, and hardness in the stone, so mobility exists in the air. Every object has its own properties, and the properties implanted in some objects are wonderful." Bhaskara believed that the earth, possessing an attractive force, drew to itself everything heavy in the atmosphere surrounding it, whence those bodies fall to it. "But," he said, "how could the earth fall into the ethereal space, since that space is equal on all sides?"

## Our Whist Column.

By "Five of Clubs."

### ILLUSTRATIVE GAME.

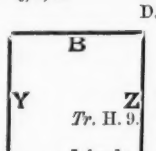
THE following game is sufficiently simple; but it serves to illustrate well the necessity of care in supporting partner's strategy and attending to details. Had *B* misunderstood *A*'s play in turning from trumps to his long plain suit, *A*'s purpose would have been foiled, and, though *A*–*B* would still have come out ahead, the game would have been missed. *Z* could have saved the game by boldly leading *A*'s established suit, but only by a single point.

### THE HANDS.

*B*: H. (*trumps*).—Q, 6, 2. C.—8. S.—A, 10, 8, 7, 5. D.—K, 8, 6, 3.

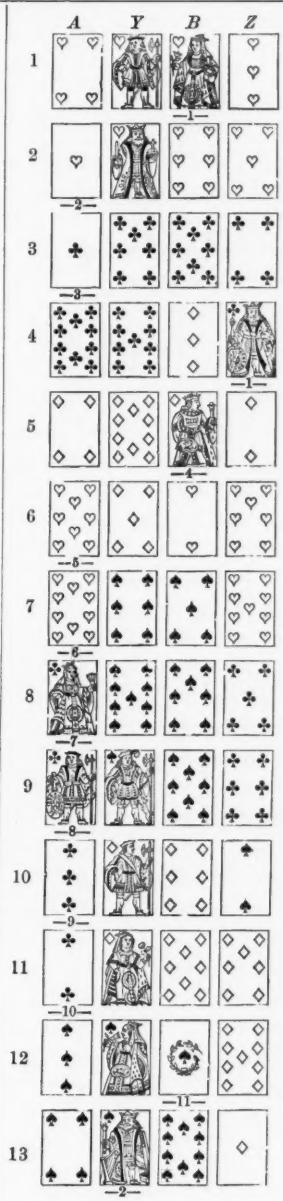
*Y*: H. (*tps*).—K, Kn. C.—9, 7. D.—Q, Kn, 10, 5. S.—K, Q, Kn, 9, 6.

*Z*: H. (*tps*).—9, 7, 5, 3. C.—K, 6, 5, 4. D.—A, 9, 7, 2. S.—2.




*A*: H (*trumps*).—A, 10, 8, 4. C.—A, Q, Kn, 10, 3, 2. S.—4, 3. D.—5.

*A B* play against *Y* and *Z*. Score:—*A B* none; *Y Z* none.




### NOTES ON THE PLAY.

Card underlined wins trick; card underneath leading next.

1. *A* properly leads trumps, with his splendid Club suit, and strength enough in trumps to give a good chance of bringing in his long suit.

2. From the return of the Six, *A* knows that his partner—who certainly holds the Two (see first round)—held only three originally. Hence he sees the minor tenace in *Z*'s hand, and that *Z* must be led through by *B*, if possible.

3. *B* now knows that, besides the second best trump (the trump card), *Z* must hold the fourth best. For, unless *A* held the major tenace as against the minor tenace, declared in *Z*'s hand, *A* would go on with trumps.

4. For *B* to ruff here would have been very bad play, though it is what nine out of ten who imagine they play whist would have done without hesitation. *B* can place all the trumps, and *Z*'s King will inevitably make some time or other. But, apart from that, *B* can see that *A*'s whole strategy will be ruined unless *A*'s long suit can be established and *Z* led through in trumps. With Ace of Spades and his well-guarded Diamond King, *B* is pretty sure to get the desired lead.

5. *Z* should here have seen the danger of the position, and that his best chance is to throw the lead into *A*'s hand. If *B* gets a lead neither of *Z*'s trumps can make, so that if *A* is driven to force *Z*, the trick so made will be clear gain, even if nothing more is obtained.

6 to the end. The game now plays itself; and the wisdom of *B*'s course in refraining from the tempting ruff at trick 4, or rather the folly he would have displayed had he ruffed at that point, is clearly seen: *A*–*B* make five by cards and the game.

If *B* had ruffed at trick 4 the game would probably have proceeded as follows:—

| *A* | *Y* | *B* | *Z* |
|---|---|---|---|
| 4.—C 10 | C 9 | H 2 | C 5 |
| | | —4— | |
| 5.—S 3 | S 6 | S A | S 2 |
| | | —5— | |
| 6.—S 4 | S 9 | S 7 | D 2 |
| | —1— | | |
| 7.—H 8 | S K | S 5 | D 7 |
| —6— | | | |
| 8.—C Q | D 5 | D 3 | C K |
| | | | —2— |
| 9.—C Kn | D 10 | S 8 | C 6 |
| —7— | | | |
| 10.—H 10 | S Kn | D 6 | H 7 |
| —8— | | | |
| 11.—C 3 | S Q | S 10 | H 9 |
| | | | —3— |
| 12.—C 2 | D Kn | D 8 | D A |
| | | | —4— |
| 13.—D 4 | D Q | D K | D 9 |
| | | —9— | |

7. *Y*–*Z* do better if *Y* here leads Diamond Queen; but it would be bad play so to lead; for the lead of Spade King saves the game surely; whereas, for anything *Y* knows, the lead of Diamond Queen might just suit *A*.

9. It is *Z*'s game to put the lead into *A*'s hand.

13. *A*–*B* make only three by cards, instead of five as in the actual game.

XUM

WHIST OR BUMBLEPUPPY.*

We are rejoiced to see a new edition of this capital little book, sparkling with fun and replete with sound whist sense. Some readers who complain that they cannot see where the whist ends and the fun begins may be comforted by learning that the whist ends on the last page, while the fun begins on the title-page. Such readers should parse carefully good Colonel Newcome's "emollunt" and "sinuisse," especially the last. It will do them good. We are pained to find that "Pembridge" does not recognise the real reading of two oft-misquoted lines of Shakespeare. The Bard of Avon must, of course, have written:—

"Twigs in the trees; stones in the running brooks;
Sermons in books; something in everything."

This is sound sense.

## THE FACE OF THE SKY FOR APRIL.

By F.R.A.S.

THE sun is as destitute as ever of interest as a telescopic object, spots being small and occurring at rarer intervals. The zodiacal light may still be detected after sunset at the beginning of the month. The night sky is shown on map iv. of "The Stars in their Seasons." Minima of Algol occur at 11h. 56m. P.M. on the 14th, and at 8h. 45m. on the 17th; as also at other times inconvenient for the observer. Mercury is a morning star throughout the whole month, and is not very well placed for observation. He may be detected with the naked eye in the east just before sunrise towards the end of the month. Venus is an evening star, and is a splendid object in the W. by N. after dusk. In her passage through the sky this month, she will pass between the Hyades and the Pleiades ("The Stars in their Seasons," map i.). Mars is quite invisible. Jupiter may be seen all night long. He is in opposition to the sun on the 21st; but unfortunately his south declination precludes the very finest definition of the details on his surface in the telescope. He will be found to the south of $\kappa$ Virginis ("The Stars in their Seasons," map v.). The phenomena of his satellites, visible before 1h. A.M., are now becoming decidedly more numerous. On April 3rd, satellite II. will disappear in eclipse at 10h. 54m. 12s. P.M. On April 5th, the egress of the same satellite from the face of the planet will happen at 9h. 10m. P.M. Then at 11h. 33m. 43s. satellite I. will be eclipsed. On the 6th, the transit of satellite I. will begin at 9h. 2m. P.M. Its shadow, preceding it, will leave Jupiter's opposite limb at 10h. 53m., the satellite itself passing off at 11h. 13m. On the 8th, satellite III. will disappear in eclipse at 8h. 54m. 32s., to reappear from occultation at 11h. 41m. On the 12th, satellite II. will enter on to Jupiter's face at 8h. 54m. P.M. Its shadow will leave the opposite limb at 11h. 2m., and the satellite casting it at 11h. 24m. On the 13th, the ingress of the shadow of satellite I. begins at 10h. 35m. P.M., and that of the satellite itself at 10h. 46m. The shadow leaves Jupiter's opposite limb at 12h. 47m., and the satellite at 12h. 57m. On the 14th, satellite I. will be occulted at 10h. 15m. P.M. On the 15th, satellite III. will be eclipsed at 12h. 52m. 39s. P.M. On the 19th, the shadow of satellite II. will begin its transit at 11 o'clock, as will the satellite itself 6 minutes later. On the 20th, the shadow of satellite I. enters on the planet's limb at 12h. 29m. P.M., and satellite I. follows it one minute later. On the 21st, satellite I. will be occulted at 9h. 47m. P.M., to reappear from eclipse at 11h. 57m. 4s. On the 22nd, the satellite I. will leave the disc of the planet at 9h. 8m. P.M., as will its shadow at 9h. 10m. On the 26th, the shadow of satellite III. will pass off Jupiter's face at 8h. 31m. P.M. On the 28th, satellite II. will reappear from eclipse at 10h. 32m. 16s. P.M., and satellite I. be occulted at 11h. 30m. On the 29th, the ingress of satellite I. will occur at 8.40 P.M., and that of its shadow at 8h. 52m. The satellite will quit Jupiter's opposite limb at 10h. 52m.; its shadow at 11h. 5m. Lastly, on the 30th, satellite I. will reappear from eclipse at 8h. 19m. 19s. P.M. Saturn is still an evening star, but is now approaching the west. He travels during April from a point to the NE. of $\zeta$ Geminorum towards $\delta$ ("The Stars in their Seasons," map ii.). By the end of the month he will be quite close to $\delta$ Geminorum. Uranus will be found between 2° and 3° to the south of $\gamma$ Virginis ("The Stars in their Seasons," map v.). The Moon enters her first quarter at 1h. 52·8m. P.M. on the 1st, is full at 5h. 38·9m. A.M. on the 7th, enters her last quarter at 4h. 3·8m. A.M. on the 15th, and is new at 8h. 53·2m. A.M. on the 23rd. She will enter her first quarter—for the second time this month—at 11h. 0·4m. P.M. on the 30th. High tides may be expected about the 7th. Occultations of stars by the Moon at convenient hours during the present month are fairly numerous, but in each case the star is a small one. Beginning with the 2nd, B.A.C. 2731, a star of the 6½th magnitude will disappear at the Moon's dark limb at 9h. 20m. P.M. at an angle of 111° from her vertex. It will reappear at her bright limb at 10h. 30m. P.M. at an angle from her vertex of 288°. On the 7th, 46 Virginis, a 6th mag. star, will disappear at her bright limb at 9h. 23m. P.M. at an angle from her vertex of 351°. It will reappear at her dark limb at 10h. 6m. P.M. at a vertical angle of 275°. At 10h. 59m. on the same night another 6th mag. star, 48 Virginis, will disappear at the bright limb at an angle of 28° from the vertex of the Moon. Its reappearance at 12h. 2m. at the dark limb occurs at a vertical angle of 271°. When the Moon rises on the 9th, she will already have occulted $\xi^1$ Libræ, a 6th mag. star. It will reappear at her dark limb at 8h. 38m. P.M., at an angle of 173° from her vertex. On the 25th, 48 Tauri, a star of the 6th magnitude, will disappear at the dark limb at 9h. P.M., at an angle of 85° from the vertex of the Moon. The Moon will have set ere it reappears. On the 29th, 3 Cancri, a 6th-magnitude star, will disappear at the dark limb 13 minutes after midnight, at a vertical angle of 199°, but the Moon will be setting when it reappears. On the 30th, 54 Cancri, of the 6½th magnitude, will disappear at the dark limb at 9h. 36m. P.M., at an angle of 74° from the lunar vertex. Its reappearance at the bright limb happens at 10h. 27m., at an angle from the vertex of 330°. Lastly, on the same night, at 12h. 25m., $o^1$ Cancri, a 6th-magnitude star, will disappear at the Moon's dark limb, at an angle of 172° from her vertex, reappearing 53 minutes after midnight at her bright limb, at a vertical angle of 236°. When these notes begin the Moon is in Gemini ("The Seasons Pictured," plate xxiv.), but she leaves this for Cancer at 4 P.M. on the 2nd. She quits Cancer in turn for Leo at midnight on the 3rd. Her passage through Leo occupies her until 1 P.M. on the 6th, at which hour she crosses into Virgo ("The Seasons Pictured," plate xxv.). She does not leave Virgo until 8h. 30m. A.M. on the 10th, when she enters Libra ("The Seasons Pictured," plate xxvi.). In her passage across Libra, she arrives at 1 A.M. on the 11th on the boundary of the narrow northern spike of Scorpio. By 10 o'clock the same morning she has traversed this, and passed into Ophiuchus. Her passage through the southern part of this constellation is completed at 2h. 30m. A.M. on the 13th, when she crosses its confines into Sagittarius. At noon on the 15th, she quits Sagittarius for Capricornus ("The Seasons Pictured," plate xxi.). Skirting the rather tortuous boundary between Capricornus and Aquarius, she does not fairly enter the last-named constellation until 4h. P.M. on the 17th. She is travelling across Aquarius until 8h. P.M. on the 19th, when she enters Pisces ("The Seasons Pictured," plate xxii.). Travelling through Pisces, she arrives at midnight on the 22nd at the dividing line of the northern prolongation of Cetus. She remains in this part of Cetus until 3h. P.M. on the 23rd, when she leaves it for Aries ("The Seasons Pictured," plate xxiii.). She only takes until 7h. 30m. P.M. on the 24th to cross Aries and enter Taurus. In her journey through Taurus she arrives at 4h. P.M. on the 27th on the boundary of the northern projection of Orion. When she has travelled through this by 4 o'clock the next morning, it is to emerge in Gemini ("The Seasons Pictured," plate xxiv.). She remains in Gemini until 10h. P.M. on the 29th, when she crosses into Cancer. She is still in Cancer at midnight on the 30th.

* "Whist or Bumblepuppy." By Pembridge. 3rd edition. G. E. Waters, and Simpkin, Marshall, & Co.

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